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Paper TRADE JOURNAL

REG. U. S. PAT. OFF.

VOLUME 126, No. 4 JANUARY 22, 1948

WOOD PULP

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Established 1886

"Facts are stubborn things."
LE SAGE

The incredible American production figures of the war years contributed much to achieving victory. American industry is now being called upon to assume a vital role in the formidable task of rebuilding the shattered economies of the world.

Paper and paper products are high on the list of commodities essential to recovery. The American Paper and Pulp Industry will respond to present day problems in the same magnificent way that it did to those of winning the war.

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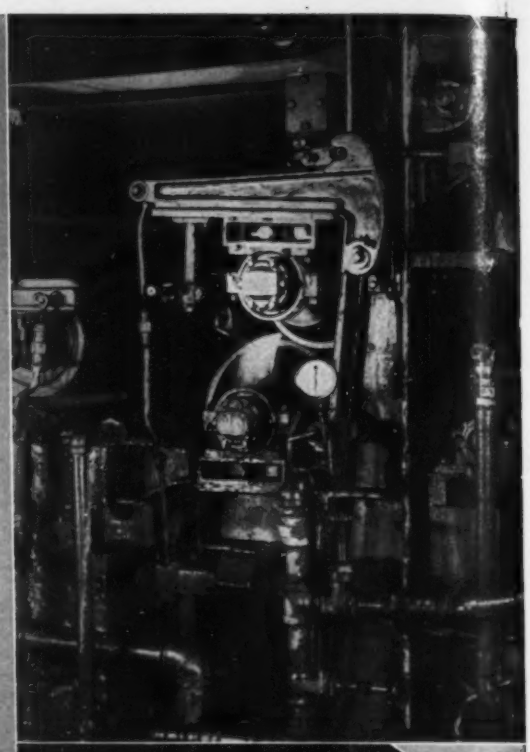

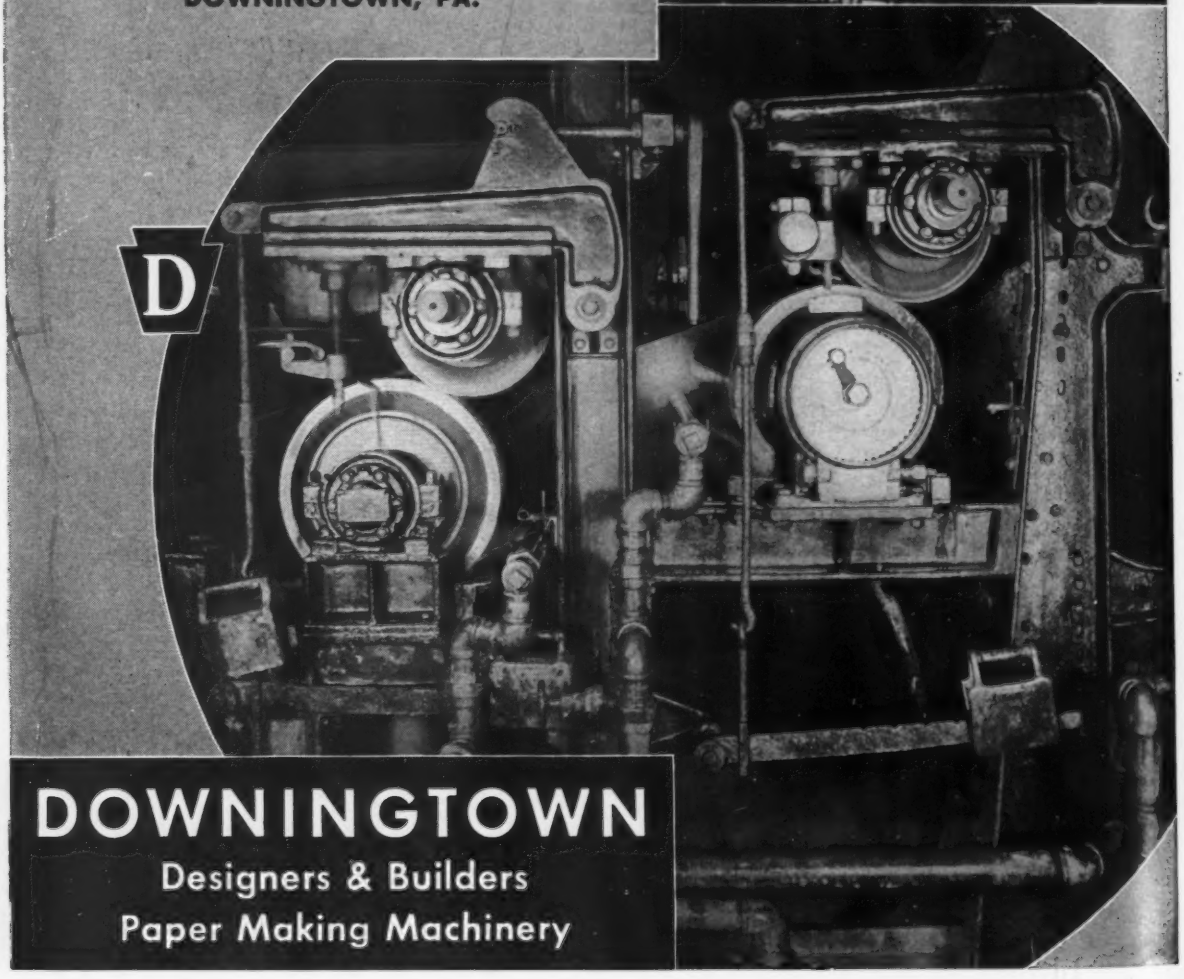

DOWNINGTOWN

Designers & Builders
Paper Making Machinery

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CALENDAR OF COMING EVENTS

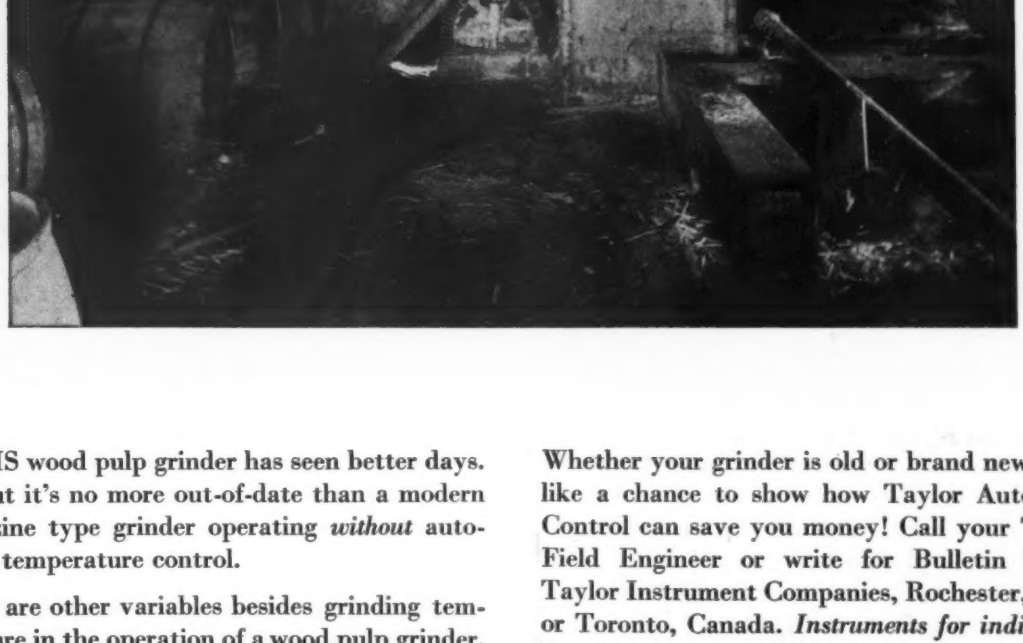
January 28-30—Technical Section, Canadian Pulp and Paper Association, Annual Meeting, Mount Royal Hotel, Montreal, P. Q.

February 23-26, 1948—Technical Association of the Pulp and Paper Industry, Annual Meeting, Hotel Commodore, New York City.

May 18-20, 1948—American Pulp and Paper Mill Superintendents Association, Annual Meeting, Roosevelt Hotel, New Orleans, La.

June 11-12, 1948—Paper & Twine Association, Annual Convention, French Lick Springs, Indiana.

OUT OF DATE?



THIS wood pulp grinder has seen better days. But it's no more out-of-date than a modern magazine type grinder operating *without* automatic temperature control.

There are other variables besides grinding temperature in the operation of a wood pulp grinder. But there is none more important from the standpoint of production, power consumption per ton, stock uniformity, and stone cost.

We can speak freely about this because the first Automatic Grinder Temperature Control was developed by Taylor Instrument Companies sixteen years ago. Since then Taylor Automatic Grinder Control Systems have been in successful operation on all types and sizes of wood pulp grinders.

Whether your grinder is old or brand new, we'd like a chance to show how Taylor Automatic Control can save you money! Call your Taylor Field Engineer or write for Bulletin 98108. Taylor Instrument Companies, Rochester, N.Y., or Toronto, Canada. *Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.*

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ACCURACY FIRST
IN HOME AND INDUSTRY

Paper TRADE JOURNAL

VOLUME 126, NO. 4 REG. U.S. PAT. OFF. JANUARY 22, 1948

Parker Concerned at Trend to Tribunals

APPLETON, Wis. — The trend in the federal government during the last 15 years toward administrative tribunals was decried Monday evening, January 12, by Cola G. Parker, president of Kimberly-Clark Corporation, in an address before the Outagamie County Bar Association.

"One of the most insidious ways in which governmental economic power has been enlarged has been through administrative tribunals and administrative law," Mr. Parker said.

"Members of the bar always have been leaders of thought and action and it's about time the bar did a little soul-searching in this matter of human freedom," he asserted.

He advised the attorneys to analyze the trend to take the freedom away from the people and to tell the people in the local community the truth, since "It is there that the need for correct thinking can be made clear. If we do our part in our local communities, we need not worry about the country."

Mr. Parker warned that if the people of the United States are to regain their full freedoms, they haven't too much time to waste. He advised the attorneys to look for security short of the control which would eliminate freedom.

He contrasted the concepts of government in the United States and in the Soviet Union — the first holding that the state should be the servant of the people, and the second that the individual should be the servant of the state.

The speaker said that encroachments on liberty and the dependence of the individual on the state must result in the loss of individual liberty. He cited the many losses of liberty in Great Britain under the Socialistic government as a warning to the people of the United States.

"From bondage to spiritual faith, through faith to courage, then to freedom; and from freedom to abundance; then comes complacency, then apathy, then fear, then dependency and back to bondage once more," was his analysis of that constant battle.

"Once we seek complete security at the hands of the state, it isn't even a short step to bondage over man," he said. "Security is mortals' chief enemy. There is ground for the opinion that we now are in the period of movement from abundance to complacency and apathy or even perhaps at the beginning of the stage of fear, for it is fear which leads to this search for security."

As examples he pointed to the handling of the public utility holding company act, the Wagner act, the wage-hour act and others, and deplored the "grasping for power so particularly evident in these new administration fields . . . which have given all powers not merely of an administrative character, but of investigator, prosecutor, judge, jury and almost of jailer, all wrapped up in a package with ribbons and bows, and labeled 'administrative law'."

Capehart Asks State Department About Newsprint Export Plan

WASHINGTON — Declaring that he has information that the State Department is considering shipment of American-made newsprint to Europe, Senator Homer E. Capehart, Rep., of Indiana, late last week warned Secretary of State Marshall that "the supply of newsprint available to the American press is still seriously short."

As chairman of the Senate Subcommittee on Newsprint, Senator Capehart wrote Secretary of State Marshall as follows:

"I am in receipt of information to the effect that the State Department is considering the shipment of some American-made newsprint to Europe for use there.

"As chairman of the subcommittee on newsprint, it has been my task for the past year, to investigate the critical shortage of newsprint in the United States and to attempt to reach some solution to the problem.

"In that investigation, the Committee learned that throughout the war period, 80 percent of the newsprint used in the United States was furnished by Canada, supplies from Sweden, Norway and other foreign countries being cut off.

"Following the war, our investigation showed, foreign supplies of newsprint trickled into the United States in quantities far insufficient to meet the increased use.

"During the most critical period of the newsprint shortage in the United States, many papers, both large and small, were faced with the possibility of reduced publication and even curtailment of publication. While there has been some relief effected, through the cooperation of publishers, producers and distributors, with the Newsprint Committee, the supply of newsprint available to the American press is still seriously short.

"In the course of our investigation, the committee members were constantly aware of the importance of the efforts of the free American press to combat the propaganda of certain forms of foreign government. We were also constantly aware of the fact that much of Europe's newsprint pro-

(Continued on page 12)

Says Maine Mills Budget $25 Million

BRUNSWICK, Me.—Everett F. Greaton, executive secretary of the Maine Development Commission, on January 12 disclosed that paper and pulp mills of Maine are planning to spend $25 million for improvements in the next five years.

COLA G. PARKER
concerned over Bureaucracy

Panelyte Sets Up Twin Sales Groups

NEW YORK—C. R. Mahaney, executive vice-president of the St. Regis Sales Corporation, subsidiary of St. Regis Paper Company, has established a broader division of responsibility in the company's Panelyte Division, made necessary by a wide increase in volume of business. William Kops has been appointed sales manager for Decorative Panelyte, and D. F. Sweet as sales manager for Industrial Panelyte.

In the conduct of the new organization, according to Mr. Mahaney, Mr. Kops will be responsible for all decorative sales and for the sales promotion and servicing of the company's decorative jobbers, distributors, agents and district offices. Mr. Sweet will be responsible for sales, sales promotion and servicing of fabricated parts, standard sheets, rods, tubes and miscellaneous molded parts other than refrigeration and high volume molded specialties. He will also be in charge of Panelyte's New York office.

J. T. Murphy succeeds Mr. Sweet as Trenton district manager.

John Heuer Joins St. Regis In Technical Operations

NEW YORK — John H. Heuer has been appointed as assistant to Fred C. Goodwill, technical director of the Printing, Publication and Converting Paper Division of the St. Regis Paper Company. He will make his headquarters at the central laboratory of the company at Deferiet, N. Y.

Mr. Heuer received his Chemical Engineering degree from the University of Washington. After being employed by the Weyerhaeuser Timber Company as a research chemist, the Oxford Paper Company as assistant sulphite superintendent, and Berst-Forester-Dixfield as research chemist, he entered the Armed Forces, serving over three years in the European Theater with the Engineering Corps. On leaving the service he was employed as technical director at the Newton Falls Paper Company until the time he joined St. Regis.

Monsanto Names Somogyi To Research Post

SPRINGFIELD, Mass.—Appointment of Erwin G. Somogyi to the newly-created position of assistant director of research in charge of process development at Monsanto Chemical Company's plastics division here, is made known by Felix N. Williams, vice-president of the company and general manager of the plant.

Mr. Somogyi will report to Dr. Nicholas N. T. Samaras, director of research. He will be in charge of the pilot plant operation, small products manufacture, mechanical development and research engineering.

For the past year Mr. Somogyi has been in charge of three plant investigation groups and the analytical laboratory at the Monsanto plant in Monsanto, Ill. He has been with the firm since 1935, and is a graduate of the University of Michigan with a degree in chemical engineering.

WALTER P. MILLER
Philadelphia knows him

United Board & Carton Promotes Blunden

NEW YORK—Appointment of James H. Blunden as sales manager of the Lowman Folding Box Division of United Board and Carton Corporation, was made known this week by William H. Allen, general manager for cartons. Mr. Blunden will be in charge of sales in the Syracuse territory.

A paper man since shortly after leaving school, Mr. Blunden has been with United's Syracuse plant since 1927. He has had actual working experience in the folding box field as sample maker, estimator and salesman.

Lawson Bonus Honors Seybold

NEW YORK—Fred W. Seybold, Chief Engineer, was voted a special bonus by the Board of Directors of the E. P. Lawson Company, Inc., at their January session in recognition of his outstanding achievements as the designer of Lawson Paper Cutters. D. W. Schulkind, President of the Lawson firm, cited Seybold for his brilliant work in designing the highly successful new series of Lawson cutters.

Ware Joins Sani-Pak

CARTHAGE, N. Y.—V. Edwin Ware, formerly associated with National Paper Products Company in Carthage as an engineer, has been appointed manager of the Sani-Pak Mills at Rockland, Del.

Committee of Seventy Again Elects Miller

PHILADELPHIA — At the forty-third annual meeting of the Philadelphia Committee of Seventy, at the Engineers' Club, Walter P. Miller, Jr., president of Walter P. Miller Company, paper box manufacturers, 452 York Ave., Philadelphia, was elected to a second term as chairman of the Committee of Seventy at its annual meeting. John S. Williams, secretary-treasurer of Williams & Marcus Company, printers, was elected to a three-year term on the executive board.

The Committee of Seventy is one of the oldest volunteer civic groups in the country and is unusual in its militant action against public officials in an effort to secure better government for Philadelphia. Because of its effective work, the Committee has often been referred to as the fourth arm of the government in Pennsylvania.

Jones Succeeds Gray at Canada Roof Products

VANCOUVER, B. C. — W. D. Gray, founder of Canada Roof Products Ltd 25 years ago, who has been manager since that time, has resigned and will form a new company for the distribution of building materials and allied lines throughout western Canada.

A. W. Jones has been appointed as the new manager of Canada Roof Products Ltd. Prior to and since the war he was engaged in technical and sales work for an oil firm in Montreal, Fort William and Winnipeg, and had five years' service overseas as O.C. 6th Field Company of Vancouver, Royal Canadian Engineers. Mr. Jones is a graduate of McGill University.

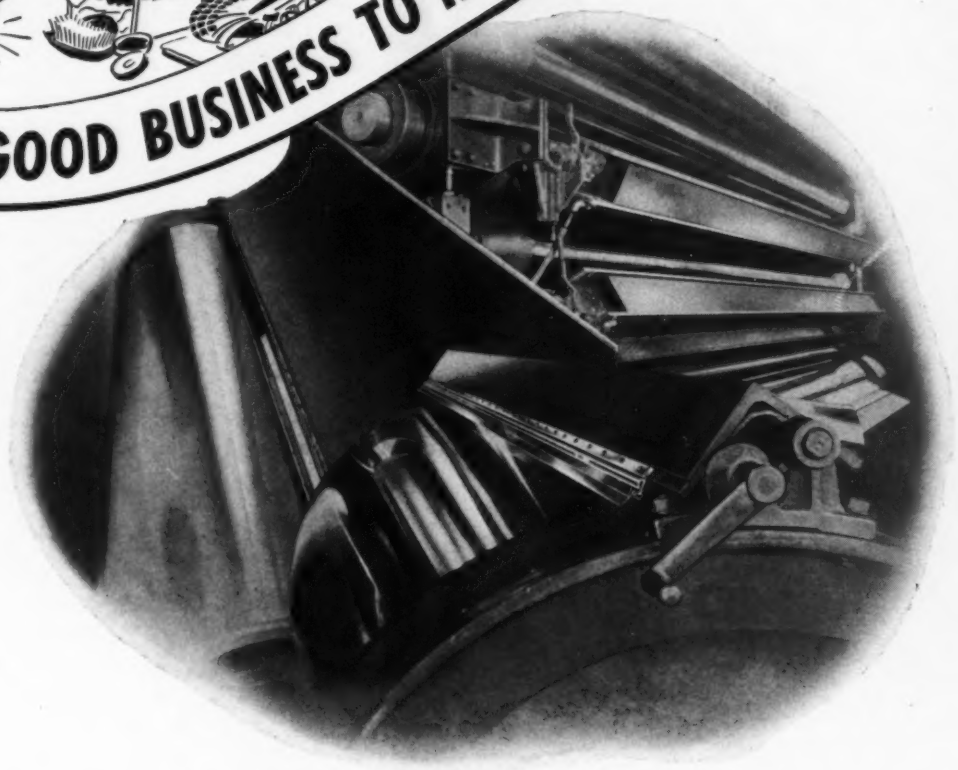
Hassett Succeeds Kelly In Rising Post

HOUSATONIC, Mass. — Frank Kelly, who has been assistant superintendent at the Rising Paper Company, here, has completed his duties to take a position as superintendent of the Stevens Paper Company, Westfield. General Manager Fred May has made known the promotion of William Hassett from night superintendent to be assistant superintendent. He has been with the firm for many years, and was beater engineer before becoming night superintendent. No one has been named to succeed Hassett as night superintendent as yet.

Warwick Promotes Whitfield

NEW YORK — Ernest Nathan, president of the Warwick Chemical Company Division of Sun Chemical Corporation, has appointed J. J. Whitfield as sales manager of the Stearate Division. Mr. Whitfield has been in charge of stearates sales in the metropolitan New York area for a number of years.

IT'S GOOD BUSINESS TO KEEP 'EM SHINING



There's *profit* as well as pride involved in keeping papermaking rolls continuously clean, smooth and shining. They pay off in terms of better paper and more of it per day at lower cost per ton.

Take a walk through the machine room and look at *your* rolls. If any of them are dull, dirty, streaky, fuzz covered, ask us to give you a layout and estimate on a Vickery Doctor engineered for each individual roll.

BIRD MACHINE COMPANY · SOUTH WALPOLE, MASSACHUSETTS

VICKERY DOCTORS— *Engineered for Every Roll...*

United Board & Carton Succeeds Paperboard

NEW YORK — Stockholders and the board of directors of the United Paperboard Company have voted to change the company name to United Board and Carton Corporation. Fred Enders, president, declares the change became effective January 2, 1948. No change of address, officers or policies is contemplated.

The change of name was decided upon when the directors recognized that the previous corporate name no longer adequately described the tremendously increased scope in which United now operates.

A leader in the field of paperboard production, package designing and manufacturing, United Board and Carton Corporation has its main office at 285 Madison Avenue, New York, with sales offices in Boston, Philadelphia, Chicago, Detroit, Syracuse and Springfield, Ohio. It operates carton plants in Victory Mills, Syracuse, Cohoes and Brooklyn, N. Y., and Springfield, Ohio; paperboard mills in Thomson and Lockport, N. Y., and Urbana, Ohio. The corporation also operates a foil laminating plant at Victory Mills.

Continental Consolidates Operations at Utica

WATERTOWN, N. Y. — The Watertown branch of the Continental Can Company, Inc., located for nearly three years at 740 Water Street, will cease operations within the next 30 days and transfer its manufacturing equipment to Utica, according to Donald W. Crainer, plant manager.

Mr. Crainer said that the company has constructed a new building in Utica with 200,000 square feet of factory space for consolidation of branch plants. Heavy equipment has already been moved there from Watertown.

The Continental opened its branch factory here in March 1945 in the Water Street building owned by the St. Regis Paper Company. The structure was formerly used by St. Regis as its printing plant.

Tileston & Hollingsworth Shows New England Scenes

BOSTON—The Twenty-fifth Anniversary Tileston & Hollingsworth Company Calendar is beautifully designed and printed by thirteen New England printers, not one of whom knew how the other was going to execute his sheet. "Each sheet is the individual work of a New England printer; each sheet stamps the character of the printer; each sheet of a different paper shows the ability of the printer; the entire work representing the product of New England printers on 'Papers of Old-Fashioned Quality' combines to prove the merits of the New England print shop."

S. J. O'CONNOR

Back in Washington for Mando

The sheets show winter scenes, ocean views, shad fishermen, fishing vessels, mountain country, and a Vermont country store.

Papers on which sheets are printed include Fairmount Offset, 25x38—70; No-Coat Gloss, 25x38—70; White Tru-Color Text, 25x38—70; and Ivory Tru-Colour Cover, 20x26—65.

F. N. Burt Buys Plumly Business

BUFFALO, N. Y. — As part of its peacetime expansion program, the F. N. Burt Company, Inc., has acquired the Eugene K. Plumly Company, Philadelphia paper box manufacturer, General Manager William C. Milsom has reported. The Philadelphia company was purchased from Plumly family interests. The purchase price was not disclosed.

Mr. Milsom said the newly-acquired concern, which has a plant employing about 80 workers in Philadelphia, will be operated as the Eugene K. Plumly Division of F. N. Burt. The Philadelphia plant produces small boxes for the cosmetic and pharmaceutical industries.

Kimberly-Clark Includes Its Vets in Hospital Plan

NEENAH, Wis.—Kimberly-Clark Corporation is including 195 retired employes in its group coverage under the Blue Cross hospital plan, paying full premium cost of such coverage for pensioned employes, as it does for active employes. Heretofore retired employes have been able to keep protection by making individual payments direct to the insurance organization.

Memphis Mill Starts Its Second Machine

NEENAH, Wis. — The second new creped wadding machine at the Kimberly-Clark Corporation's Memphis plant was started operating this month, a little more than a year after the first employes moved into the 14-acre building on the northern outskirts of the Tennessee development, where Charles Eubank, formerly of Neenah, is manager.

The first creped wadding machine of the new plant started up Thanksgiving day to manufacture Kleenex that would make a daily strip 4,000 miles long. The new machine produces an equal amount, and thus doubles the daily output. The machines turn out 2,000 pound rolls of Kleenex wadding; have single parts weighing as much as 60 tons, each accurate to a hair's breadth. The equipment has electronic devices to control thousands of parts automatically.

Another Kimberly-Clark expansion program with two "operating firsts" is at Niagara, Wis. The largest spherical bearing ever made in the United States is to be installed as part of the new calender stack at the mill. The other "first" is the new groundwood grinder which handles four-foot wood instead of the former foot wood.

Kimberly-Clark's Niagara Falls, Ontario, unit has received the distinguished service to safety award of the National Safety Council, the first K-C mill to be so honored. The award was in recognition of 1,081,947 man-hours without a disabling injury.

Mando Reopens Its Washington Office

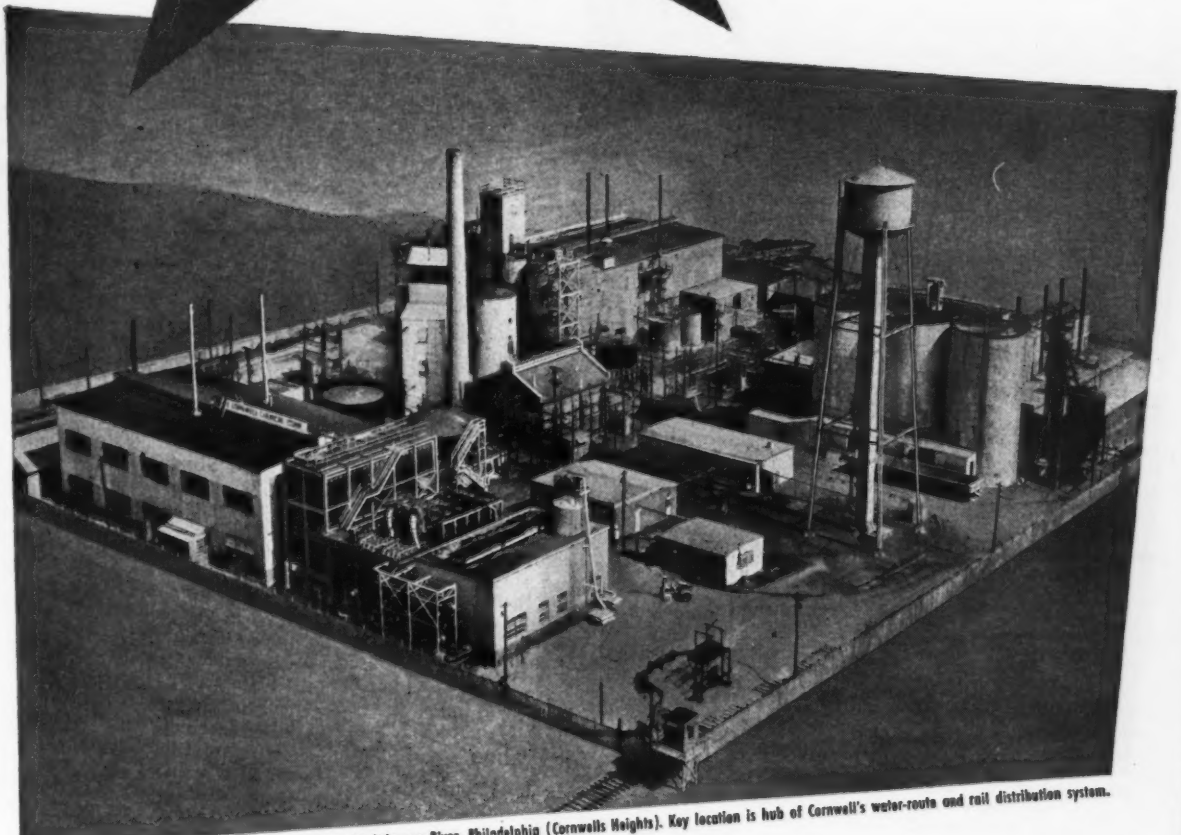
WASHINGTON, D. C.—Reopening of a Washington office with the appointment of Stanley J. O'Connor as manager has been revealed by Donald D. Davis, president, Minnesota and Ontario Paper Company. In his capacity of manager, Mr. O'Connor will act as liaison in all matters between company and government officials, keeping abreast of current governmental policies and regulations as affect the pulp, paper and insulating board industry.

This is the second trip to Washington in this role for Mr. O'Connor. During the war he handled priorities for Mando in its war-time filling of government contracts.

Mr. O'Connor has been associated in various capacities with Mando Industries since 1933. Prior to this present appointment, he had been manager of By-Products Sales for the company. A graduate of St. Thomas College, St. Paul, Minnesota, Mr. O'Connor took further training at American University at Beaune, France.

SALT CAKE

.....paper makers' grade



Plant and Laboratories of the Cornwell Chemical Corporation on the Delaware River, Philadelphia (Cornwells Heights). Key location is hub of Cornwell's water-route and rail distribution system.

Cornwell Chemical Corporation

CORNWELLS HEIGHTS (PHILADELPHIA), PA.

Telephone: Torresdale (Phila.) 4-7358 Cornwells 0302 Cables: SEECHEM

Newsprint Production Set Record in 1947

NEW YORK—North American output of newsprint paper in 1947 was 5,645,718 tons, of which 4,446,789 tons were made in Canada, 825,554 tons in the United States, and 373,375 tons in Newfoundland. These totals were made public late last week by the News Print Service Bureau. The Canadian output was 7.3 percent greater than in 1946, that in the United States was 7.1 percent more, with a gain of 3.0 percent in Newfoundland, making a total increase of 368,765 tons, or 7.0 percent. Production in 1947 was also higher than in any preceding year.

Stocks of newsprint paper at the end of December were 44,563 tons at Canadian mills, 8,301 tons at United States mills, and 48,842 tons at Newfoundland mills, making a combined total of 101,706 tons compared with 119,494 tons on November 30, 1947, and 161,742 tons at the end of December 1946.

Production in Canada during December 1947 amounted to 368,925 tons and shipments to 369,986 tons. Production in the United States was 65,880 tons and shipments were 68,720 tons. The output in Newfoundland was 28,899 tons and shipments were 42,786 tons making a total North American production of 463,704 tons and shipments of 481,492 tons, compared with continental production of 430,420 tons and shipments of 443,440 tons in December 1946. North American production in December 1947 was greater than in any previous December on record.

De Laval Assigns New Duties To Its Executives

TRENTON, N. J. — Major executive promotions and organizational changes, effective January 1, has created a five-member executive committee of the De Laval Steam Turbine Company consisting of H. L. Watson, president, serving as chairman; George C. Stoddard, chairman of the board; Henry W. Johnson, vice-president; C. Richard Waller, vice-president, and George W. Smith, Jr., assistant to the president.

J. P. Stewart has been appointed manager of the newly combined commercial and marine sales divisions succeeding H. V. Petersen, who has retired after thirty-four years' service. H. G. Bauer, manager of the marine division, has been appointed executive engineer of the company. J. W. Hertzler, manager of worm gear sales since 1924, has retired and is succeeded by W. A. Reynolds, who becomes manager of the combined IMO rotary pump and worm gear divisions. C. A. Jurgensen has been appointed acting works manager. Appointment of W. A. Neumann, Jr., as factory controller, assistant treasurer and assistant secretary was announced previously.

Lachapelle at Boston For E. P. Lawson

NEW YORK—Roland J. Lachapelle has been appointed manager of the Boston office of E. P. Lawson Company, Inc., by D. W. Schulkind, president of the firm. Mr. Lachapelle will have his headquarters at the Boston office of the Lawson firm at 170 Summer Street, where he will be in charge of the sale of Lawson paper cutting machines, drills and drill slotters, as well as the various lines distributed by Lawson.

Mr. Lachapelle was born in Fall River, Mass., and is a graduate of the Montreal Technical Academy. He is a member of the Boston Craftsmen Club and the Connecticut River Valley Printing House Craftsmen.

Mando Sales Reach Toward $50 Million Mark

MINNEAPOLIS — Net sales of the Minnesota and Ontario Paper Company for 1947 amounted to $48,998,126 as compared with 1946 figures of $29,464,110. President Donald D. Davis, in making these figures known this week, declared that preliminary figures indicate net profits for the last quarter will compare favorably with those for preceding quarters of the year. Detailed figures are to be made public in the annual report that will be ready late in March.

Sidney Roofing Again Makes Fibrerock

VICTORIA, B. C.—Sidney Roofing & Paper Company, Ltd., have again commenced the manufacture of Fibrerock, a fireproof insulating slab, which is designed for exterior sheathing and as a stucco and plaster base. Fibrerock was produced by the Sidney Roofing plant before the war, but discontinued during war years.

The company has now completed a new separate plant at Victoria covering an area of 8,000 square feet and this plant will concentrate on the sole production of Fibrerock. The product will be fabricated in sheets four feet by nine feet and one inch thick. At a later date two-, three- and four-inch thicknesses for non-load bearing partitions are planned.

Finland Increases List Of Products for France

WASHINGTON—Finland will ship to France chemical pulp, pulp wood, wallpaper, pasteboard, paper bobbins, and liquid resin, among a list of additional products called for under a Finnish-French trade agreement recently reported to this government. The original agreement, dated last March, provided for export to France of Finnish cellulose pulp, paper, cardboard, and sawn lumber, among other items.

Newspaper Inventory Rose in December

NEW YORK — Daily newspapers reporting to the American Newspaper Publishers Association had 36 days' supply of newsprint on hand and in transit at the end of December 1947. This represents an increase of 3 days' supply compared with stocks on hand at the end of November 1947. These stocks of 36 days at the end of December 1947 compare with 31 days at the end of December 1946; 37 days at the end of December 1945, and 44 days at the end of December 1941. These stocks on hand and in transit include a considerable amount of tonnage brought in by water in the summer, use of which by some newspapers is spread over a period of several months.

Daily newspapers reporting to the ANPA consumed 322,136 tons of newsprint in December 1947 compared with 294,835 tons in December 1946 and 274,471 tons in December 1941. This was an increase in December 1947 over December 1946 of 9.3 percent and an increase over December 1941 of 17.4 percent.

The total estimated newsprint consumption in the United States for December 1947 was 429,515 tons which includes all kinds of uses of newsprint. For the year 1947 it is estimated to be 4,752,904 tons. During the year 1947 the reporting newspapers used 3,564,678 tons of newsprint, an increase of 13.7 percent over the year 1946 and an increase of 21.0 percent over the year 1941.

Capehart Asks About Newsprint Export Plan

(Continued from page 7)

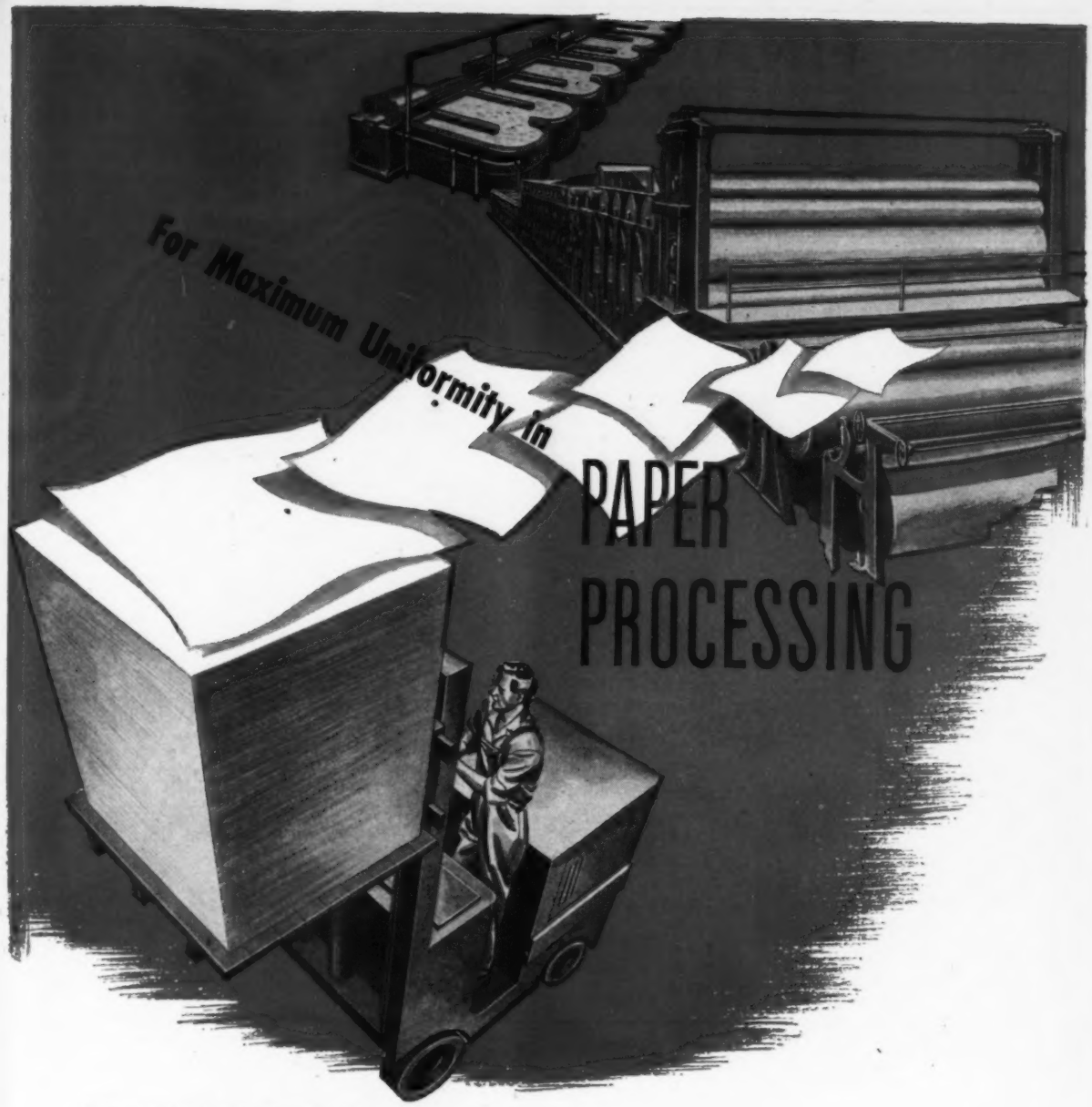
duction was being acquired by a foreign government which was participating and is still participating, in a propaganda program contradictory to our form of government.

"You will recall that about a year and a half ago, the State Department explored a possibility of importation into the United States of newsprint from Germany. At that time, the State Department's policy was to the effect that European newsprint should be used in Europe to assist in the building up of German economy before considering exports of newsprint to the United States.

"At the present time the United States is receiving small shipments of newsprint from the Scandinavian countries, and it is upon these imports that the American free press is depending to a great extent for relief from the shortage here.

"It seems to me that we are endangering one of the basic principles of free government if we create a condition that tends to stifle our free press."

He asked the Department to furnish import and export data.



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FINANCE

Brown Studies Plan Of Recapitalization

BERLIN, N. H.—Brown Company directors are working on a recapitalization plan, F. G. Coburn, president, wrote to common and preferred stockholders January 15.

The letter was in answer to stockholders' queries about prospects for: preferred dividend payments; and a recapitalization plan that would provide new securities in place of the present preferred stock on which 548 of unpaid dividends have accumulated.

Consolidated net earnings, after interest and taxes, for the fiscal year ended November 30, 1947, are estimated at $2,800,000 compared with $1,593,982 in 1946. Only $2,030,000 of the 1947 earnings, however, are available to Brown Company, because only a part of the earnings Canadian subsidiary (Brown Corporation) can be brought to the United States under the Canadian foreign exchange control board's regulations.

"In considering any recapitalization plan," Mr. Coburn stated, "directors and stockholders alike must be mindful that the company's earnings in war years, and since, have been attained under conditions at full capacity operation and of prices at exceedingly high levels, conditions that obscure high cost factors of production. For the long pull the company must be prepared for operations at rates substantially lower than full capacity, and lower levels of prices.

"Directors together with their legal and financial counsel for some months have been working and are actively continuing work on the problem of devising a plan of recapitalization. This plan must be equitable as between the preferred and the common stockholders; it must provide fairly, within the capacity of the company, for the accumulated unpaid dividends; and must not impose a preferred dividend charge on the company that it cannot carry together with its obligations with respect to payment of debt and restoring the companies to competitive strength."

Dow Releases Saran Trademark Rights

MIDLAND, Mich—Donald Gibb, head of plastics sales division of The Dow Chemical Company, declared on Monday that his company has formally released its trademark rights to the name "Saran" permitting it to become the descriptive name of the product. Gibb said the action was taken "in the interest of simplifying identification on various plastic materials whose chemical names have for years been confusing to press, trade and consumer alike."

The term Saran applies to a series of thermoplastic resins chemically known as vinylidene chloride copolymers originally developed by Dow in the latter thirties and known especially for their resistance to a wide range of chemicals. Monofilaments of the plastic are currently becoming prominent in the textile field. Moisture repellent packaging films and corrosion resistant piping are other important uses of the plastic.

Its Corn Protected K-C Paper Output

NEENAH, Wis.—Kimberly-Clark Corporation uses about 200,000 bushels of corn in five months' operation to provide corn starch for coating its book paper products. Daily consumption is about 20 tons of the starch, which require about 2,000 bushels of corn for each 24 hours.

The corporation receives bagged starch by the carload, and strives to keep inventories high and to meet manufacturing requirements at its Niagara, Niagara Falls and Kimberly mills. In 1946 the supply outlook was very uncertain, largely because of heavy government buying, and millers would not promise delivery except on a month to month basis. A worsening of the situation might have resulted in mill shutdowns.

K-C attempted to find substitutes, such as rice flour and potato starch, but these were unsatisfactory, and the corporation found it necessary to contract for a supply of corn to help carry the mills over the critical period, in order to supply the millers if necessary, to fill its own needs. In the fall of 1946, Kimberly-Clark bought 200,000 bushels on the commodity market for future delivery. When the situation improved last spring, millers were able to promise deliveries on a three-month basis. The corporation disposed of its holdings about six months after entering the futures market.

Sidney Roofing Lets Contract

VICTORIA, B. C.—Sidney Roofing & Paper Company, Ltd., has awarded contract to G. H. Wheaton, 1207 Douglas Street, for the erection of a reinforced concrete room at its plant at Victoria. The contract is valued at $100,000.

FINANCIAL RECORD OF THE WEEK

New York Stock Exchange

High, Low and Last for Week Ending January 17, 1948

STOCKS

	High	Low	Last
A. P. W.	4⅞	4⅝	4⅝
Armstrong Cork Co.	47	45	45
Armstrong Cork Co., pf.	92¼	91½	92
Celotex Corp.	26½	25½	26
Celotex Corp., pf.	19⅞	19⅜	19⅜
Certain-Teed Products Corp.	17	16⅛	16¼
Certain-Teed Products Corp., pf.	....	....	....
Champion Paper & Fibre Co.	21¼	21	21
Champion Paper & Fibre Co., pf.	....	....	....
Congoleum Nairn Co.	31¼	30¼	30¼
Container Corp. of America	41¾	40¼	40¾
Container Corp. of America, pf.	98	97¾	97¾
Crown Zellerbach Co.	33¼	31	31
Crown Zellerbach Co., pf., 4.20	97	95⅛	95⅛
Crown Zellerbach Co., 4 pf., 4	124	124	124
Dixie Cup Co.	....	....	....
Dixie Cup Co., A.	53½	53	53
Flintkote Co.	34	33½	34
Flintkote Co., pf.	102¾	101⅞	101⅞
Robert Gair	8⅝	7⅝	7¾
Robert Gair, pf.	19¾	19	19¼
International Paper Co.	52⅜	50¼	50¼
International Paper Co., pf.	96½	95½	96½
Johns-Manville Corp.	40¾	39½	39½
Johns-Manville Corp., pf.	107	107	107
Kimberly-Clark Corp.	22⅛	20⅜	20⅜
Kimberly-Clark Corp., pf.	100½	97	98½
Mac Andrews & Forbes	38½	38½	38½
Mac Andrews & Forbes, pf.	....	....	....
Marathon Corp.	23½	22⅜	22⅝
Mead Corp.	20	19	19½
Mead Corp., pf. 4¾	93⅝	93	93⅝
Mead Corp., pf. 2	41½	40½	40½
National Container Corp.	13¼	12½	12¾
Paraffine Companies, Inc.	77¾	75½	75½
Paraffine Companies, Inc., pf.	98	98	98
Rayonier, Inc.	29½	27¼	28
Rayonier, Inc., pf.	34	33⅜	33⅝
Ruberoid Co.	63½	58	58⅝
St. Regis Paper Co.	9⅜	9½	9⅜
St. Regis Paper Co., pf.	82	82	82
Scott Paper Co.	43¼	42	42
Scott Paper Co., pf.	95	95	95
Sutherland Paper Co.	41⅞	41⅞	41⅞
Union Bag & Paper Corp.	32½	31⅜	31⅜
United Paperboard Co.	....	....	....
U. S. Gypsum Co.	105½	97¼	101¼
U. S. Gypsum Co., pf.	174	174	174
United Wallpaper	5⅞	5⅝	5⅝
United Wallpaper, pf.	....	....	....
West Virginia Pulp & Paper Co.	42¼	41¼	42
West Virginia Pulp & Paper Co., pf.	105½	105½	105½

BONDS

Celtotex Corp., 3¼s '60	....	....	....
Certain-Teed Products Corp., 5½s '53	....	....	....
Champion Paper & Fibre Co., 3s '65	....	....	....
Mead Corp., 3s '68	....	....	....

New York Curb Exchange

High, Low and Last for Week Ending January 17, 1948

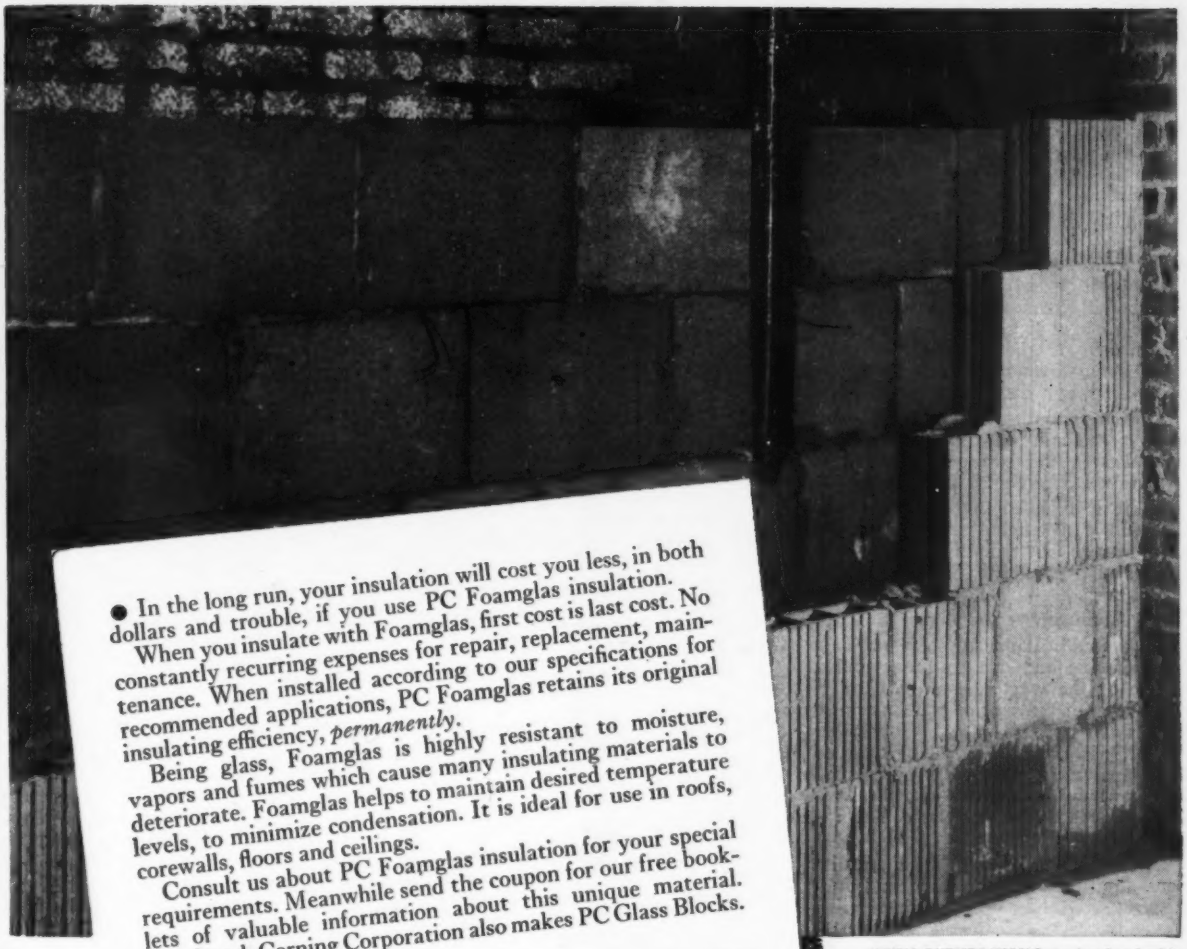
STOCKS

	High	Low	Last
Great Northern Paper Co.	44½	42⅜	42⅞
Taggart Corp.	10⅞	10½	10⅞

BONDS

American Writing Paper Co., 6s '61	....	....	....

What's the long-term story on insulation costs?



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Lee Submits Plans To Clean Up River

LEE, Mass. — Plans for a municipal sewage disposal plant in this town — independent of Smith Paper, Inc. — have been submitted for approval to the Massachusetts Department of Public Health, according to John M. Deely, chairman of the Lee sewage committee. This is the latest move locally to clean up the Housatonic River in this area.

The report was discussed at a recent meeting of state engineers from the Department of Public Health, experts from the National Council for Stream Improvement, officials of Smith Paper, Inc., and members of the committee.

The committee's report will also be made to the townspeople at the annual town meeting next month, when the voters will consider an article to see if the town will accept the provisions of an act of the Legislature which entitles the town to borrow money to build a sewage disposal plant.

For two months a pilot plant, used to test methods of combining industrial wastes and sewage, has been in operation at the Smith Paper plant.

"It is still hoped that the town and the mill can combine wastes in the same system, but the state has not considered this feasible," the committee's report stated.

The statement continued:

"The Smith Paper disposal problem is a difficult one due to the complex nature of the wastes. Joseph H. McCarthy, chief chemist of the Lawrence Experimental Station, and Worthy H. Taylor, assistant sanitary engineer of the Department of Health, presented data covering recent experiments with these wastes at the Lawrence laboratories.

"Although promising, the results were admittedly inconclusive and further research has been outlined with the cooperation of the state Department of Public Health, the National Council for Stream Improvement, and Smith Paper, Inc."

Wisconsin Will Experiment In Woodlot Planting

MADISON, Wis.—The Wisconsin Conservation Department will conduct an experiment in woodlot planting next spring which it hopes will lead to a statewide program of reforestation of privately-owned lands. Under the program about 1,000 acres will be leased in three Rock county townships. The leases will run for five years.

Working with local conservation groups, county officials, Boy Scouts and farmers whose lands will be leased at $1 per acre, the department plans to do cover-planting of shrubs and trees and fence in woodlots of about ten acres each to keep livestock out of the areas. The Federal Wildlife Service will bear 75 percent of the cost, estimated at $15,000, and the department will pay the remainder. It is hoped that the long-range program will help develop woodlots of greater commercial value from the standpoint of forest products, prevent erosion and develop better game cover.

Seek Funds to Control Connecticut Floods

HOLYOKE, Mass. — A total of $755,000 for flood control work at Holyoke, $315,300 for Springdale and $256,000 for Chicopee are being asked by the Army Engineers for the coming year, Congressman Engle of Michigan has announced. These sums—part of the budget totals submitted to Congress—will be welcomed by paper mill officials here, who suffered millions of dollars worth of damage in 1936 when the Connecticut River flooded out their mills.

One Massachusetts member of Congress has pointed out that it was assumed last year that all necessary appropriations had then been made for Holyoke and Springdale flood control work. He suggested the money now wanted by the Army Engineers reflects increased construction costs. Army engineer officials were not immediately available for comment.

Army engineers said the $755,000 they are now asking for Holyoke flood control is for work on levees, flood walls and six pumping stations. The Holyoke project is scheduled for completion in January, 1949.

The $315,300 for Springdale covers work on levees, flood walls and appurtenent structures and one pumping station. Completion is scheduled for next January.

The $256,000 asked for Chicopee will involve work on the Willimansett dike and Charbonneau Terrace pumping station, the Army engineers said. All requests, which must be approved by Congress, are for the 12-month period starting July 1, 1948.

SKF Promulgates New Appointments

PHILADELPHIA — Three changes in personnel of district offices of SKF Industries, Inc., have been made by R. R. Zisette, general sales manager of the ball and roller bearing firm. They are appointment of: John H. Tipton, as assistant district manager of the Cincinnati office; M. H. Courtenay, as assistant district manager of the Atlanta office; and E. A. Hutson, as field engineer in the Railway Sales Department of the Chicago office.

Tipton joined SKF in 1936 and has been a field engineer in the Cincinnati office since 1943. Courtenay, with the Philadelphia firm more than 20 years, served as field engineer in the Atlanta office. Hutson joined SKF in 1942.

Holyoke Protests River Development

HOLYOKE, Mass.— The Holyoke Chamber of Commerce has dispatched a telegram to the Federal Power Commission in Washington, protesting vigorously the granting of a temporary permit to the municipal Gas and Electric Department in regard to the development of power rights of the Connecticut River.

The Chamber further requests that a hearing be granted by the commission and that proper notification be given all interested parties.

The text of the telegram follows:—

"The Holyoke Chamber of Commerce, by a duly adopted vote of its executive board, hereby protests the granting of the temporary permit applied for by the Gas & Electric Department of the City of Holyoke, covered by Application No. 1983, because

"(1) It threatens the destruction of rights, and installations of numerous manufactures.

"(2) It will destroy a substantial amount of taxable property without furnishing commensurate value from the proposed project.

"(3) It will divest the city of Holyoke from control of its Gas and Electric department.

"(4) The City of Holyoke, by action of its mayor and Board of Aldermen, has refused to sanction the action of the Gas and Electric commissioners in filing the said application for a temporary permit, and

"(5) The Gas and Electric Commission of the City of Holyoke has withdrawn its petition for enabling legislation, filed with the clerk of the Massachusetts Senate, which petition was originally filed for the purpose of implementing the said application.

"The Holyoke Chamber of Commerce requests that a hearing be held upon the matter of granting said application, and that it be given notice and an opportunity to be heard."

Citing the action of the majority of the Board of Aldermen which refused to endorse or approve the department's application for a permit for power rights to the Connecticut River, Mayor Henry J. Toepfert also sent a telegram of protest to the Federal Power Commission.

The telegram read as follows:

"The municipal government of the City of Holyoke, represented by a majority of the Board of Aldermen and the Mayor, have refused to endorse or approve the application of the Gas and Electric Department of the City of Holyoke for a permit looking to the granting of a license to it for project number 1983 now pending before you. Therefore, as Mayor of the City of Holyoke, I respectfully protest the granting of such application of the Gas and Electric Department of the City of Holyoke."

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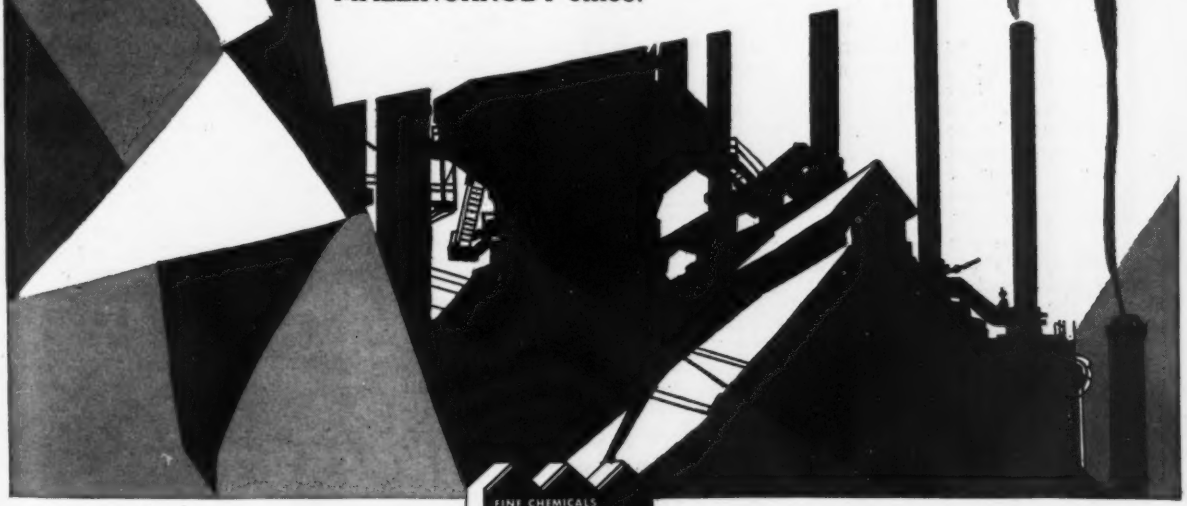

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Recknagel Heads New St. Regis Forestry Work

NEW YORK — St. Regis Paper Company, in consolidating its forestry activities, has appointed A. B. Recknagel as technical director. Roy K. Ferguson, president, in making the appointment public, points out that St. Regis, in common with other paper companies, has recently extended its holdings of timberlands so that technical problems of forest production have become increasingly complex.

Mr. Recknagel is a forester of long experience. Since his graduation from the Yale Forestry School in 1906, he has had many opportunities to observe and study forestry in various parts of the United States and Canada. He also spent a year studying in Europe and thus became familiar with forest operations in leading European countries.

After serving in the United States Forest Service in several capacities, Mr. Recknagel went to Cornell University in 1913, where he remained until the outbreak of World War II. During the war, Mr. Recknagel was Area Forester for the War Production Board in the State of New York and had the responsibility of developing timber supplies for the war effort. At the close of the war he entered the consulting forestry field and has specialized in problems relating to the development of timber production, with particular attention to the growth of pulpwood.

At Cornell University he taught forest management and utilization, and in the year just before the war was head of the Forestry Department there. Mr. Recknagel is now serving as Acting Head of the Forestry Department of the University of British Columbia, Vancouver, where he will remain until the close of the college year. Thereafter, it is planned to set up the Forestry Department of St. Regis Paper Company, with headquarters in New York, and to develop a staff to work on the technical forestry problems of the company's holdings.

Mr. Recknagel is a long-time member of the Society of the American Foresters and served on the National Council of the Society. He is also Advisor to the Northeastern Forest Experiment Station of the U. S. Forest Service, and a member of its Advisory Council. Except for the period of war service, he has been secretary of the Empire State Forest Products Association for nearly thirty years. As author of textbooks dealing with forest management and other aspects of forestry, and in technical articles in the *Journal of Forestry*, he is well known to the profession.

Mr. Recknagel's elder son, Bernard, Jr., is in charge of the office of pricing and statistics of the St. Regis Paper Company. His younger son, Thomas, is in the U. S. Department of State as Third Secretary, American Legation in Sofia, Bulgaria.

A. B. RECKNAGEL

According to Mr. Recknagel, close cooperation wil be maintained with the U. S. Forest Service, with the State Conservation Departments, and with all other agencies, as well as with foresters in private or corporate employment.

Survey Shows Aspen To Be Widely Used

MADISON, Wis. — Aspen accounted for about a third of the total Lakes States pulpwood consumption of 2,225,000 cords in 1948, according to a United States Forestry Service survey. Included in the Lakes States are Wisconsin, Minnesota and Michigan.

In 1946, aspen for the first time became the principal pulpwood species in the region, while a decade before only about 90,000 cords of aspen pulpwood were produced in the area. Second to aspen for the industry were the pine species, with about 492,000 cords, according to the Milwaukee regional headquarters of the forest service. Spruce was third, with 416,000 cords.

About 75 percent of all the 2,900,000 cords of pulpwood received by the Lakes States mills during 1946 were produced within the region. Minnesota accounted for 43 percent, Michigan for 38 percent, and Wisconsin about 19 percent. All but about 50,000 cords were consumed by mills within the region.

Badger-Globe Foremen Install New Officers

NEENAH, Wis.—A discussion on corporation policies was held at a dinner meeting of the Kimberly-Clark Badger-Globe Foremen's club January 12, led by William Kellett and John Simonich. Officers were installed, plans for the year were discussed and committee reports were presented.

Powell River Names Hagenstein Forester

VANCOUVER, B. C. — Powell River Company Limited has appointed W. D. "Bill" Hagenstein to its Forest Department. He will be primarily concerned with the development and formulation of forestry working plans for Powell River Company Limited.

Mr. Hagenstein has had a great deal of experience both in the logging industry and in forestry in the Pacific Northwest. He started working in the woods in 1927, and since then has done everything from setting chokers to felling timber, engineering and running camp. He was graduated from the University of Washington, College of Forestry, in 1938, specializing in logging engineering. He received his M.F. degree from Duke University in 1941, and the same year joined the West Coast Lumberman's Association in the capacity of Forester and Forest Engineer. From 1943 to 1945 Mr. Hagenstein acted as consulting logging engineer to the Corps of Engineers of the U. S. Army and to the Bureau of Yards and Docks (Seabees) of the U. S. Navy, serving in the South and Central Pacific theatres of war.

In 1945 he was transferred to Costa Rica, acting as logging superintendent on the American Chinchona Plantation project. In the fall of the same year he returned to his former position with the West Coast Lumberman's Association where he has remained until now.

Diamond Match Executives Meet in Holyoke

SPRINGFIELD, Mass.—R. J. Fairburn of New York City, president of the Diamond Match Company, attended a conference of plant managers and other company officials recently at Hotel Kimball. The conference was arranged to check up on developments in the various plants and to plan for improvements, it was reported.

Representatives from the mechanical departments from plants in this city, Oskosh, Mich.; Chico, Cal.; Barberton, O.; and Oswego, N. Y., were present.

Besides Mr. Fairburn, other high company executives who attended were Vice-Presidents J. E. Duffey and W. O. Augustine, both of New York.

Hooker Staff Honors Retiring Veteran

NIAGARA FALLS, N. Y.—Thirty-six years of service at the Hooker Electrochemical company were recognized by fellow workers who gathered at a dinner at Luigi's restaurant to honor Henry G. Abie, veteran employee at Hooker, who will retire December 31.

During the dinner Abie, a foreman in the Cell Repair department, was presented with a watch and other gifts by his colleagues. Frank W. Dennis, personnel director at the company, delivered the main talk.

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Lake States Hears of Optical Properties

APPLETON, Wis.—The Lake States Section of the Technical Association of the Pulp and Paper Industry held its January meeting at the American Legion Club House on Tuesday, January 13. Approximately one hundred people braved the brisk weather to attend.

C. J. West, Jr., of the Kimberly-Clark Corporation presided and introduced J. A. Van den Akker of The Institute of Paper Chemistry, the speaker of the evening. Dr. Van den Akker discussed the optical properties of paper. He opened the discussion by pointing out that the visual appearance of paper is not, in general, amenable to instrumental evaluation. Gloss is an optical property of the paper surface which can be evaluated. The different concepts of gloss were noted and attention was given to the angular distribution of light reflected from paper surfaces. Nonglossy surfaces exhibit rather a uniform angular distribution of reflected light while glossy, or shiny surfaces show a concentration of reflected light at the angle of mirror-like reflection. This fact is the basis of design of photoelectric glossmeters. Dr. Van den Akker then took up the optical properties dependent upon the internal structure of the sheet. He emphasized the importance of scattering and absorption in the sheet and defined the scattering and absorption coefficients. The relationship between these coefficients and the reflectance of a single sheet backed by a nonreflecting object and the reflectance of a thick pad of the paper was presented. The dependence of opacity, in terms of contrast ratio and printing opacity, upon these co-efficients and reflectances was explained. The use of charts which present this relationship in graphical form was demonstrated by sketching the method of calculating the change in basis weight required to yield a given change in opacity of the sheet.

Those present included: Ernest P. Adams, A. P. Adrian, Joe Atchison, Arnold Beaman, A. P. Bellinghausen, A. M. Borders, Peter B. Borlew, Martin Bretl, Lloyd J. Broehm, Joe Brown, James P. Buchanan, M. A. Buchanan, H. O. Buckwalter, T. C. Catlin, T. Collins, Robert J. Courtney, R. F. DeLong, Jack Dickson, H. P. Dixson, Wm. A. Fannon, George W. Forcey, L. V. Forman, Fred M. Foster, Willard H. Gehrke, Herbert F. Gardner, Carl Gelbke, Kenneth E. Glidden, John Graff, W. S. Grimes, H. H. Haldeman, Paul B. Hansen, John A. Hanson, A. M. Heald, Merle Heath, Thomas Heiss, John F. Helms, Raymond W. Henschel, R. Howard T. A. Howells, A. F. Jankowski, Wm. S. Kennedy, Frank Kottwitz, Jos. J. Kryszak, Otto Kuehmerling, A. Laux, N. L. Malcove, W. W. Marteny, Wm. Martin, S. H. Matthews, Earl L. McCabe, Gordon Morseth, G. P. Mueller, John J. Nylund, S. R. Parsons, Leroy E. Patterson, Earl P. Pennings, A. Phillips, H. A. Samuelson, C. E. Schaefer, Martin F. Schnaufer, Milton A. Schreiner, E. C. Schuler, Horace T. Scoroas, G. R. Sears, Les Sebora, L. A. Shipman, E. H. Shriver, L. E. Simerl, F. A. Soderberg, John Spalding, W. Spearin, Clyde W. Steele, P. W. Stott, Robert E. Strauss, Robert Stuart, M. L. Taylor, S. Roy Turner, Walter C. Utschig, J. A. Van den Akker, Bruce Weber, J. D. Wells, Sidney D. Wells, C. J. West, Jr., Roy P. Whitney, Willmer Wink.

HARRY E. WESTON

To open Chicago office for Superintendents Association.

N. Y. U. Starts Seminar On Paper and Inks

NEW YORK — The relationship of printing inks, paper and printing processes will be discussed in a seminar evening course, the first of its kind, beginning February 10, at New York University's Division of General Education, according to Dean Paul A. McGhee. The course will be conducted at the Barbizon-Plaza Hotel in fifteen sessions held each Tuesday night, 6 to 7:45 p.m.

Dean McGhee stated that the course is intended to help define and coordinate problems and procedures of publishing, printing, photo-engraving and the manufacturing of paper and ink.

The group discussions will be led by Harold M. Annis, staff production manager of the Oxford Paper Company; John Crosson, assistant vice-president of McGraw-Hill Publishing Company, and William S. Hodgkiss of the analytical section, Research Department, Sun Chemical Corporation.

TAPPI Discusses Petroleum Products

HUDSON FALLS, N. Y.—The Hudson Valley Chapter of the Empire State Section of TAPPI met for a dinner meeting on January 16th at the Kingsbury Hotel. The speaker was Dr. John C. Dean, manager of the Chemical Products Division of Socony-Vacuum Oil Company. He is a 1930 graduate of Yale University where he also obtained his Ph.D.

Speaking on the subject "Petroleum Products in the Pulp and Paper Industry," Dr. Dean said in part:

The petroleum industry normally markets 16 million barrels per year of lubricating oils and allied products. These include a variety of processing materials and are differentiated from gasoline, fuel oil, and asphalt. Of this quantity, the paper industry purchases over 3 million barrels annually. The paper industry is thus the petroleum industry's largest customer for its "blue chip" products.

The scope of petroleum's value in pulp and papermaking is also underestimated. The largest item is paraffin wax, which is used for coating and impregnating paper and paper products. From an annual yearly production of 700 million pounds, the paper industry consumes at least 80 percent —4 pounds per capita in the United States. Little known microcrystalline or amorphous wax is used in amounts of 100 million pounds for laminating and coating paper. Practically every foodstuff packaged in paper is protected by a wax film supported by the paper or paper board.

From petroleum also come wax emulsions, or wax sizes, used to impart water resistance and improved appearance to a variety of special papers. These augment conventional rosin sizes that have been employed for centuries.

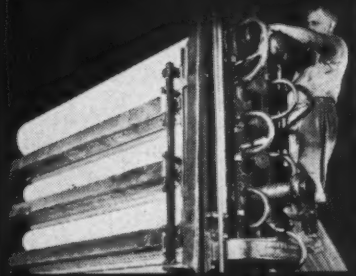
Lately a new pulping aid has been developed from a synthetic petroleum oil. This product is added to wood chips in the pulping process. It speeds up the operation and increases yields.

The following attended the meeting: H. J. Winegard, A. Marshall, Lawrence T. Ross, D. D. Linehan, E. A. Phelps, R. D. Moynihan, A. L. Mosher, R. I. Wynne-Roberts, Henry W. Fales, R. E. March, James Gormely, R. J. Trimbey, Russell E. Grey, Fremont R. Magee, S. T. Moore, H. G. Nourse, John C. Dean, Warren A. Beman, Robert S. LaRue, W. E. Deland, Neil Houston, M. C. Nillis, H. B. Richmond, C. T. McGreen, V. P. Edwardes, A. B. Copping, K. K. Taylor, R. M. Drummond, F. J. McCourt, P. H. Bird, I. P. LaHaise, Gerald Roider, R. H. Wiles, Leon H. Larson, J. L. Harrington, Stanley Buss, Allen A. Lowe, J. W. Crocker, Kenneth L. Seeber, Richard Collins, Jr., Cleon R. King, Wm. Leeson, H. Freeman, Michael B. Gormely, G. W. Russell, Foster P. Doane, Jr., G. E. Clink.

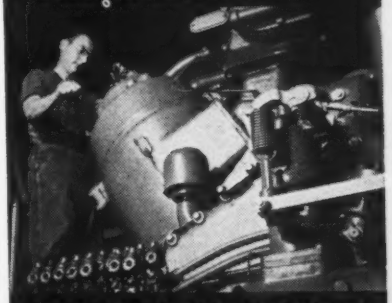
JOB PROVED

RUBBER MANUFACTURER saved $3,000 a year with a Sun Processing Aid.

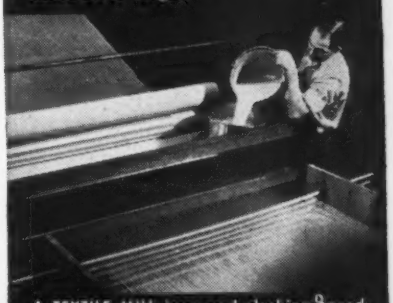
ALUMINUM PARTS MANUFACTURER increased output 43% with Sun Cutting Oil.



PAPER MILL slashed annual lubrication bill $2,874 by using a Sun Grease.



POWER PLANT found Sun Diesel Lubricant lasted 50% longer.



A TEXTILE MILL increased slashing speed 60% by adopting a Sun Processing Oil.

SUNOCO EMULSIFYING CUTTING OIL—A self-emulsifying oil which produces a stable white emulsion when mixed with water. Sunoco is an efficient and economical cooling and lubricating medium for turning, milling, drilling, and other metalworking operations on both ferrous and non-ferrous metals. It is also an excellent grinding coolant.

SUN QUENCHING OILS—Specially refined oils designed to develop maximum physical properties in a wide variety of steels.

SUN TEMPERING OILS—Specially refined oils for tempering steel up to 550°F. Due to their low carbon content and stability under heat, these oils have an unusually long service life.

SUN ROLLING OILS—Straight and emulsifying oils which will permit maximum production in rolling steel, aluminum and brass.

SUN ANTI-RUST COMPOUNDS—Petroleum base oils with chemical additives designed to prevent the rusting and corrosion of steel.

SUN PROCESSING OILS

SUNOTEX TEXTILE OILS—Designed to impart certain additional properties to various forms of fibers during their processing from the fiber state into a manufactured product. All Sunotex textile oils are emulsifiable in water.

SUN COTTON CONDITIONING OILS—Pale mineral oils which condition the cotton. They prevent waste by cutting down excessive amounts of "fly" or fine air-borne particles of lint.

SUN ASBESTOS FIBER CONDITIONING OIL—Used for spraying on the asbestos during processing. Fibers are not so readily damaged or broken down into harmful dust when this product is used.

SUN CORDAGE OILS—Are adaptable in various formulae used by cordage manufacturers. They are selected products which are highly compatible with additives.

CIRCOSOL—2XH (Rubber Processing)—An elasticator and processing aid for GR-S particularly.

CIRCO LIGHT PROCESS OIL (Rubber Processing)—A processing aid and excellent softener for natural rubber, natural rubber reclaims, and neoprene synthetic rubber particularly. Used for GR-S to some extent.

SUNDEX 53 (Rubber Processing)—An inexpensive product suitable for processing GR-S and blends of GR-S and natural rubber. An established outstanding processing aid for footwear rubber stocks.

CIRCOMAR-5AA (Rubber Processing)—A black colored product used in reclaiming natural rubber scrap. Used also as substitute for asphalt fluxes in processing natural and GR-S rubber. Free-flowing at room temperature.

SUN LEATHER OILS—Mineral base leather oils. Used for obtaining the desired tensile strength, proper temper and a controlled moisture content. They maintain a light even color . . . mix well . . . distribute evenly.

SUN MISCELLANEOUS INDUSTRIAL PRODUCTS

SUN SPIRITS—For the thinning of paints, varnishes, and enamels. Also for metal cleaning. This product is a pure water-white petroleum solvent and is free of corrosive sulphur.

SUN WAXES—Used in packaging, sealing, coating, waterproofing and for numerous manufacturing and chemical processes.

PRODUCTS

SUNOCO

Local 45 Resumes Banquet and Dance

WATERTOWN, N. Y. — The Papermakers' Local, No. 45, of Deferiet, International Brotherhood of Papermakers, last week held its first annual banquet since 1943 at the Club Colonial on Bellew Avenue.

The chief speakers were Alexander Smalley of New York, director of the labor relations department of the St. Regis Paper Company; Ernest Lambton, of Utica, New York State regional director of paper mill unions; Edward F. Marshall, of Deferiet, resident general manager of the St. Regis Paper Company, in charge of north country operations; and Clifford C. Wenzel, Deferiet, personnel manager of the St. Regis Company for the northern group.

George H. Martin, of this city, president of the Papermakers' Local, No. 45, presided.

More than 275 persons, members of the local and their wives, attended.

Phillips Sworn in As Burns' Successor

ALBANY, N. Y. — Paul L. Phillips, Voorheesville, was sworn in as tenth president of the AFL International Brotherhood of Papermakers. He was installed by the retiring president, Matthew J. Burns, Albany, in a ceremony at the 62-year-old union's international headquarters, 30 Sheridan Ave.

New England Celebrates Publishing Week

BOSTON—Printing and Publishing Week of New England, the second celebration in this area, in which a number of members of the paper industry took a prominent part, gave to the public generally a greater knowledge of the graphic arts and their position and importance in community and national life.

The observance opened January 12, with members of the region's graphic arts industry inviting the public to inspect their plants and equipment and become better acquainted with their work. A colorful exhibit of "best pieces" of printing from New England printing houses was on exhibition in the State Suite of the Copley Plaza on the evening of the banquet January 15. George Wallis, of the sales service department of Storrs & Bement arranged the exhibits. From outside New England was a special display of United Nations printing, appropriate to the interests of the principal speaker of the evening.

BEMIS HOLDS CLINIC ON SEWING MACHINE PROBLEMS

Bemis Bro. Bag Company, which manufactures bag closing threads and twines as well as bags, has established its "Sewing Machine Clinic." The clinic, two sewing machine specialists with a specially mounted bag sewing head and other equipment, moves from city to city inviting representatives from plants in that area to attend the demonstrations and discussions. The demonstrations include the complete dismantling and reassembling of a sewing head and instructions on the handling of common problems encountered in sewing machine operation. The clinics are informally conducted. During question and answer periods the participants have a chance to solve their various individual problems, or to go more deeply into phases of the subject which are of particular interest to them.

Holyoke Unions Seek City Post for Moore

HOLYOKE, Mass.—Holyoke's two big paper mill labor unions are starting a campaign for the appointment of Edward W. Moore, organizer for the International Brotherhood of Papermakers, AFL, as Gas and Electric Commissioner to fill the vacancy caused by the death of James L. Tighe.

The papermakers are particularly interested in the Gas and Electric Commission in view of a recent attempt to federalize power on the Connecticut River, thus taking away the water power rights of the city's numerous paper mills.

Paper Mills Workers Union, No. 226, at a largely-attended monthly meeting recently, endorsed Mr. Moore's candidacy for the commission. Eagle Lodge of Papermakers, No. 1, passed a similar endorsement at its regular monthly meeting about the same time.

The two paper mill unions, representing about 1,900 workers in Holyoke's biggest industry, are sending letters endorsing Moore to Mayor Henry J. Toepfert, the aldermen and the other AFL and CIO unions in Holyoke.

It is understood that leaders of the paper mill unions, the Central Labor Union and the CIO United Electrical Union, have already had a conference at which a united front of organized labor, both AFL and CIO, was agreed upon, subject to the endorsement of the membership of these groups.

The candidacy of Mr. Moore, who comes of a papermaking family, is in line with the stand of the Central Labor Union for a representative of organized labor on the important Gas and Electric Commission. In keeping with that stand, the CLU last year engineered the defeat of Mayor Toepfert's appointee to the commission, Henry V. Burgee, vice-president and general manager of the Parsons Paper Company.

Mr. Moore goes into the fight for the Gas & Electric Commission post with his cards on the table as far as the current power controversy is concerned.

He is in favor of only a preliminary survey which the Gas and Electric Commissioners — Edward D. Hallisey and Fairfield Whiting, and the Gas and Electric manager, Francis H. King —have asked for permission to make. In this he reflects the stand taken by Eagle Lodge of Papermakers, whose members passed a resolution endorsing this survey.

The Gas and Electric Commission is a three-man, unpaid body whose members are appointed by the mayor, subject to approval of the board of aldermen. The direction of the affairs of the city-owned Gas and Electric department is vested by state law in the commission and manager.

HOW *Flexible* . . .

SHOULD THE RIGHT ADHESIVE BE?

RELY on National . . . with its interest in your individual requirements . . . for an adhesive that will be flexible enough to meet all plant and field variations.

Let's look at some individual requirements. A hard luggage adhesive should be easily handled and versatile. It should adhere vulcanized fiber to plywood . . . 'draw on' leather to wood, fabric, paperboard, etc., . . . bond wood molding inside sample cases . . . laminate multiple plies of veneer before shaping under heat and pressure . . . and offer exceptional resistance to weather and fungus. A soft luggage adhesive should leave bonded leathers and treated fabrics with an outstanding softness and pliability.

An upholstering adhesive should provide adequate tack and speed for hand adhering cloth to cloth, chipboard, wood, wadding, etc. It should be free from residual odor and any tendency to penetrate and stain light fabrics.

A labeling and overcoating adhesive should bond to wood, fiber, painted steel, tin and glass. It should be weather-proof, vermin-proof, age-proof.

It doesn't matter whether your adhesive problem is a run-of-the-mill packaging, converting, assembling job or a brand new postwar problem. National is interested in creating an adhesive formula that will meet your individual requirements . . . provide sufficient flexibility for material and commercial variations . . . withstand all extremes of shipping and consumer uses. Your inquiry is invited — NOW!

• Offices: 270 Madison Avenue, New York 16; 3641 So. Washtenaw Avenue, Chicago 32; 735 Battery Street, San Francisco 11, and other principal cities. In Canada: Meredith, Simmons & Co., Ltd., Toronto. In England: National Adhesives, Ltd., Slough.

National ADHESIVES

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EQUIPMENT AND SUPPLY NEWS

Beckman MX-5 Measures Radiation

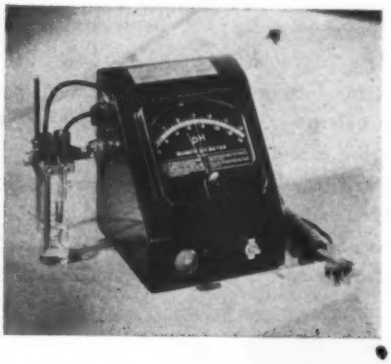
SOUTH PASADENA, Calif. — The growth of atomic energy projects and the expanding use of radioactive substances have developed a need for better instruments to detect and measure radioactivity. Protection of personnel and the safe handling, not only of radioactive ubstances themselves but also of materials which can be damaged by exposure to radiation, such as photographic film, are serious problems which are encountered in many industrial and research operations. Recognizing this need, National Technical Laboratories, manufacturers of Beckman pH Meters and other Beckman instruments, has developed several portable radiation instruments incorporating many novel design features. Recently marketed is the Beckman Model MX-5 Radiation Meter, a portable Geiger-Muller counter weighing only 9 pounds, for the detection and measurement of X, beta, and gamma radiations.

The instrument is ideal for the measusement of radioactivity of low intensity, such as locating isolated radioactivity leaks or lost radioactive materials in factories and industrial applications . . . for mineralogical surveys . . . for checking apparatus and equipment for contamination by small amounts of radioactive materials . . . for following the course of tracer elements and other radioactive materials of low intensity . . . and for laboratory and experimental work. Since the instrument, including the GM tube, is completely waterproofed and the case desiccated, the unit is excellent for use in humid climates, in wet weather and on board ships.

The MX-5 Meter is battery operated, with the self-quenching GM tube mounted on a three foot probe. A selector switch gives three operating ranges, 20, 2 and 0.2 mr/hr. The MX-5's new type circuit eliminates zero control, features rapid meter response and extends battery life to 400 hours. An external control to compensate for changes in battery voltage and tube characteristics permits calibration under any operating condition. The aluminum case has a smooth hard finish and all external surfaces are made of material not easily contaminated. Literature available on request to Beckman Instruments, National Technical Laboratories, South Pasadena, California.

Portable Macbeth pH Meter Is Line Operated

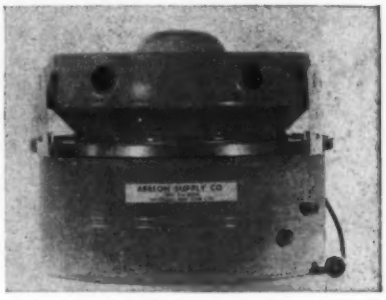
NEW YORK — Easy to operate, easy to use, the Macbeth is described as the original AC direct reading pH meter, lightweight, sturdy and accurate. The physical scope of its utility is limited only by its proximity to the nearest AC power outlet. There are no batteries in the instrument, it is easily portable by reason of its sturdy, aluminum-cast case, may be operated by untrained personnel. It is intended for industrial and laboratory use where there exists a need for an inexpensive, all-purpose pH meter to maintain a constant pH check upon production. Continuously indicating from 0 to 14 pH, it is easily adapted to titration work. Using a conversion factor to millivolts, oxidation - reduction measurements can be made.



Weight of unit with accessories approximates 11 lbs., dimensions 6½" x 6¾" x 7½", accuracy .1 pH, sensitivity .05 pH. Described in Bulletin 4A of Macbeth Corporation, 227 West 17th Street, New York 11.

Abbeon Introduces Waltons Humidifier

This new humidifier differs from the Standard Walton Industrial Humidifier which has been in industrial use for a number of years. Like all Waltons it requires no steam, no pumps or compressors, is noiseless in operation, is completely self-contained, and atomizes in a vapor form finer than cigarette smoke. In the new model, however, the pan is completely covered and the air brought in from the bottom through a fiber-glass filter, an arrangement which is calculated to save ninety percent of the cleaning time.



New Walton Industrial Humidifier

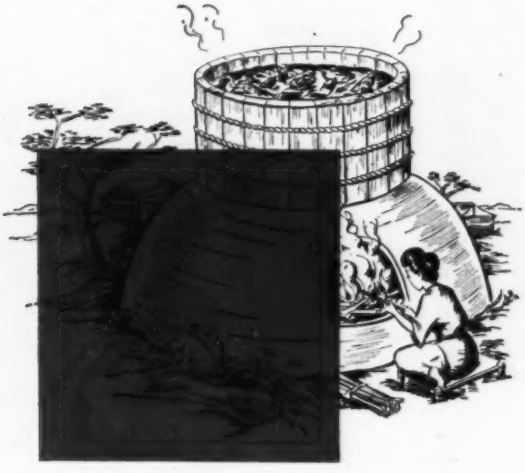
Outstanding characteristics of the new Walton are its vaporization capacity of a gallon per hour, its direct connection to regular water supply, its directional domes of 360 degrees or single or two directional, its ball-bearing motors which draw less than 100-watts per unit making operating cost about fifty cents per month, and its construction of heavy-gauge copper or other non-ferrous material.

Installation is easily accomplished by means of its hanging brackets and simple connection to single water pipe, no return waterline being required. Descriptive literature obtainable from Abbeon Supply Co., Woodside, N. Y.

Cyanamid Issues Book On Resin Adhesives

NEW YORK—A new 12-page booklet dealing with Cyanamid resin adhesives has recently been published by the Plastics Division, American Cyanamid Company, 30 Rockefeller Plaza. This brochure, produced in full color, describes the products made by Cyanamid, illustrates the range of applications where they have been found effective, and indicates the important savings and sales advantages which may be gained through their use. Copies will be mailed upon written request.

Interesting facts about PAPER



According to the Chinese encyclopedia, silk waste was used in paper making until 105 A.D. when T'sai Lun, famous Chinese statesman, invented a paper made from bark, hemp, rags and old fish nets.

INTERESTING FACTS ABOUT BISMARCK BROWN RX CONC. DUSTLESS

Tinctorially one of the strongest of basic colors, BISMARCK BROWN RX CONC. DUSTLESS is used extensively to produce browns, tans, and as a dulling agent for the brighter Acid, Basic and Direct colors in both sized and unsized papers. Although it does not dye bleached fibers well, its excellent solubility makes it well suited for both beater and calender coloring.

BISMARCK BROWN RX CONC. DUSTLESS is widely used in such paper applications as kraft, poster, tissue, wrapping and boxboard.

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NEW LITERATURE

Rotameter Catalog Released by SK

PHILADELPHIA—Schutte and Koerting Company's new 36-page Bulletin, 18-R, covering SK Rotameters, Specific Gravity Indicators and Flow Indicators is obtainable. Text, illustrations, drawings and photographs describe the various regular and special SK Rotameters, also several types of SK Flow Indicators, Specific Gravity Indicators, Flow Alarms and related equipment.

Among the Rotameters included are several chemical rotameters for service under corrosive conditions, armored rotameters for severe high pressure uses, sanitary rotameters for food products, and electronic rotameters which measure and continuously record rate of flow.

A complete section explains SK Rotameters in general and their method of operation. Mathematical formula for this operation is derived in another part of the bulletin. New tables permit easy selection of correct rotameter for a specific application either fluid or gas.

For copies of Bulletin 18-R write to Schutte and Koerting Company, 12th & Thompson Streets, Philadelphia 22, Penna.

Westinghouse Booklet Describes Axiflo Fans

An eight-page color booklet describing the economic and versatile performance of the new line of Westinghouse Axiflo fans suitable for high temperature applications has been released by the Westinghouse Electric Corporation.

Especially significant in the design is the low resistance cone housing that keeps the motor, belts, and all bearings out of the air stream, thereby introducing a great variety of high-temperature applications never before possible with conventional fans.

Complete with pictures of the various models available in either the elbow or straight-through type, the booklet describes how the unique cone arrangement and other features including low maintenance and ease of installation make these positive pressure fans suitable for such applications as air conditioning systems, heating and ventilating, dust and fume removal, equipment and machinery cooling, heat treating non-ferrous metals, and industrial drying and processing.

To provide a wider range of operating conditions, Axiflo fans are available with either three-bladed aluminum alloy or eight-bladed welded steel fan wheels. Characteristics and special advantages of each are listed.

Gardner Offers New Line Of Slitters and Winders

BROOKLYN—A newly perfected line of slitters and winders, comprising four models of each, has been made ready for the market by the Gardner Pattern & Model Works, 1614 Stephen Street, Brooklyn 27, with the promise of early delivery. Models A and B, with two drum surface winders, have 4 and 6¼ inch diameter platen roll and drum, respectively, with 24 inch diameter rewind rolls and 32 inch mill rolls. Models C and D have the same platen roll variations and the same mill roll, but offer a 17¾ inch maximum rewind diameter.

All models include as standard equipment 10⅜ inch slitter levers, ten 1 inch wide spacers, one standard wind shaft, one standard unwind shaft, and one set of plain M.R. chucks. Added equipment available includes constant tension, side register, cellophane and duplex attachments, the last named being for models C and D only. All models are equipped with ball or roller bearings and thrust bearings.

Bristol's New Catalog Is Printed in French

WATERBURY, Conn.—A new general catalog entitled, "Specification Index for Bristol Instruments," has just been published in the French language by The Bristol Company. The catalog contains twenty-four pages of information on the Bristol line of automatic controlling, recording, and indicating instruments for use in industry and gives hints on how they can be used effectively to save time, and money and promote efficient operation in manufacturing processes. Specification data is given on each instrument listed.

The booklet is liberally illustrated with line drawings, which show basic methods of applying various types of industrial instruments.

Boston Gear Works Names Chirurg

NORTH QUINCY, Mass.—The Boston Gear Works, Division The Murray Company, has appointed the James Thomas Chirurg Company, Boston and New York, as its advertising agency. The Boston company manufactures a broad line of mechanical power transmission equipment, marketed nationally through 62 distributors in major cities.

The Chirurg company's Boston office is in charge, and campaign plans are now being formulated, in cooperation with Grafton B. Perkins, advertising consultant for the Boston Gear Works.

ARMCO'S NEW "ELC" RESISTS CORROSION

HERE

Now you can save money and avoid future service troubles by specifying the new ARMCO Stainless Steel Type 316 ELC (Extra Low Carbon) for your welded processing equipment.

Annealing after welding is no longer necessary to prevent intergranular corrosion. Type 316 ELC staunchly resists corrosive attack near the welds when your wet processing equipment is in service. The reason for this is that this special-purpose new ARMCO Stainless Steel has a *maximum carbon content of .03%*.

Heretofore, in certain kinds of paper-making equipment, the excellent corrosion resistance of Type 316 has been safeguarded by adding columbium as a carbon-stabilizer.

Now the low carbon content of ARMCO Stainless Type 316 ELC accomplishes the same purposes—*at less cost.*

This new grade is ideal for welded equipment exposed to corrosive conditions at temperatures below the sensitizing range. It can be used to advantage in acid bleaching equipment, blow pit bottoms, blow pit target plates, acid digesters, inlet manifolds, screen plates and size cookers (resin).

Get more information about ARMCO "ELC" Stainless Steel. Find out how you can take advantage of the special corrosion-resistant properties of this stainless steel. Just fill in and mail the handy coupon. Or ask your equipment fabricator to inquire about ARMCO "ELC". The American Rolling Mill Company, 137 Curtis Street, Middletown, Ohio.

Export: The Armco International Corporation

ARMCO STAINLESS STEELS

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35 paper machines installed!

That's experience!

Yes, EBASCO engineers offer you a total fund of experience gained from installing 35 paper machines over the past 20 years.

They also offer you the complete EBASCO facilities for designing, purchasing, construction and installation.

This kind of service will pay you well in speed and profits for your next job —whether you plan expansion, modernization or a complete new paper mill.

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OBITUARY

Laurence R. Stark

WATERTOWN, N. Y. — Laurence R. Stark, of this city, chief erecting engineer of the Bagley & Sewall Company, died of heart disease at Monte Alegre, Province of Parana, Brazil, recently, according to notice received at the Bagley & Sewall Company.

Mr. Stark, a native of Scotland, about 66, had been in Brazil for the past two years supervising the erecting of three paper machines for the Industrias Klabin do Parana, at Sao Paulo. Details of his illness and death are slight so far as received by the Bagley & Sewall Company, except that he suffered a sudden heart attack and died a short time later.

The big mill, where he was engaged, is one of the largest in South America and is located in mountainous country.

Mr. Stark was sent to Brazil to supervise the setting up of a 192-inch Fourdrinier newsprint machine, a 120-inch six-cylinder board machine and a cylinder machine for the manufacture of various grades of tissue papers.

During his connection with the Bagley & Sewall Company Mr. Stark had traveled all over the world. In the early fall of 1940 he was sent to Adelaide, Australia, to set up a large Bagley & Sewall machine for Cellulose, Australia. He was there during the war and prior to the Australian job he spent three years in Russia, of which two was devoted to setting up a Bagley & Sewall order, after which he devoted a year to teaching maintenance.

Harvey Garrett

PHILADELPHIA — Harvey Garrett, well-known Delaware County paper manufacturer, died Thursday last at his home in Drexel Hill, after a short illness. He was 78. Mr. Garrett was owner of the Edwin T. Garrett Paper Company, on Providence Road, Lansdowne, a firm founded by his grandparents, and continued by his parents, Edwin and Alice Garrett.

He has been a resident of Upper Darby Township for 70 years, and was an early member of the Keystone Automobile Club and served as director from 1914 until his death. He was a member of the Philadelphia Paper & Cordage Association.

Surviving him are his wife, Helena Levis Garrett, two daughters, Mrs. Margaret Garrett Brown and Miss Caroline Harvey Garrett, and a sister, Mrs. Bartram Bunting of Seaside Heights, N. J.

Services were held at 2 p.m. Monday, and interment was made in Arlington Cemetery, Drexel Hill.

Bjarne Johnsen

ERIE, Pa.—Bjarne Johnsen, Director of Laboratories for the Hammermill Paper Company, died on January 9, from a heart attack. Dr. Johnsen was born in Stavanger, Norway, in 1884, and was a graduate of Darmstadt, receiving his doctorate from the University of Zurich. Prior to joining the Hammermill organization he was employed for a year and a half by the Riordan Pulp and Paper Company, Hawkesbury, Ont., and two years by the Forest Products Laboratories of Canada. For three years he was assistant to Professor Schwalbe at Eberswalde in Germany.

He was a member of the Technical Association of the Pulp and Paper Industry since 1917. He is survived by a sister, Mrs. C. B. Thorne of Hawkesbury, Canada, and a sister and a brother residing in Norway.

Vladimir Karapetoff

NEW YORK — Dr. Vladimir Karapetoff, consulting engineer and Professor Emeritus of Electrical Engineering at Cornell University, died at Park West Hospital in New York on Sunday, January 11, following coronary occlusion. Dr. Karapetoff was widely known as consultant to General Electric Co., Roebling's Sons, Klason Co., and J. G. White Co.; also as a musician and author. He specialized in the application of mathematics to industrial problems. In 1936 he married Miss R. M. Cobb, research director of Lowe Paper Company, and came to the metropolitan aera to live in 1938, after retiring from Cornell.

Dr. Karapetoff became blind during the war after serving as technical censor, but since then, he had been consultant to Bethlehem Steel Corp., and had also worked out several mathematical short-cuts for papermakers. Services were held at his residence, 39 Claremont Ave., New York City, Dr. Norris Tibbetts of Riverside Church officiating. Many of his friends in the paper industry attended.

Joseph A. Bonneau

HOLYOKE, Mass. — Col. Joseph A. Bonneau, 55, head of the Mt. Tom Box Company, veteran of two wars, and one of the best-known businessmen in Holyoke, died recently at Providence Hospital after a brief illness.

In the intervals between his periods of varied military service in this country and abroad, Col. Bonneau engaged in a number of business enterprises in Holyoke, took leading part in civic affairs, and was an active sports enthusiast.

He was a founder of the Mt. Tom Box Company, for the manufacture of cardboard boxes, largely for use by shippers of paper products in this vicinity.

what the paperboard industry sees in

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CMC

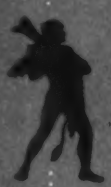
A YEAR AGO we asked the industry, "What do you see in CMC?" Today, paperboard manufacturers—among the first to explore the possibilities of this new chemical material and to recognize its value—have found that:

Hercules® CMC gives paperboard added internal and surface strength!

Hercules CMC gives paperboard added resistance to penetration by oils and waxes which, in turn, promotes higher quality gloss ink printing, ink economy, and wax savings!

Although full-scale production was not begun until just a year ago, when Hercules introduced CMC to the paper industry, this new cellulose gum has been under investigation at Hercules Experiment Station since 1944. Therefore, Hercules CMC is the result of continuing research and long-time production experience.

Hercules CMC—the sodium salt of carboxymethylcellulose—is a free-flowing, white, water-soluble, granular powder, supplied in 100-lb. cartons. For prices and delivery data or for detailed technical information, mail the coupon today.



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PPB-1

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Plastic Coating on Holyoke Program

HOLYOKE, Mass.—The January meeting of the New England Section of the Technical Association of the Pulp and Paper Industry was of especial interest to converters. About 120 attended the dinner which was held at the Roger Smith Hotel on Friday night, January 16, 1948, and participated in the program. Mr. C. H. Child, technical director of the Merrimac Paper Co., chairman of the section, presided over the meeting and R. H. Mosher, technical director of the Marvellum Co., was in charge of the program.

Because of the scope of the problem, a panel discussion was held with the audience submitting written questions after the formal presentations. The panel consisted of Ralph T. Nazzaro, Agawam Chemicals, Inc.; Paul H. Yoder, Pyroxylin Products, Inc.; John H. Rich, Plastic Film Corp.; and Mr. Mosher.

Mr. Nazarro spoke on lacquer coatings and briefly outlined the plastic materials which have found use in this application. The first lacquer was probably developed in England in 1835 but they were not of much importance until the development of cellulose nitrate about the time of World War I. Since that time there have been many other materials used for lacquers including the cellulose derivatives, the alkyds, synthetic and natural rubbers, the vinyl polymers, and urea, phenol, and melanime resins. Because viscosity of the coating solution is controlled by the molecular weight of the resin, formulations must take molecular weight into primary consideration.

Mr. Yoder then discussed the hot melts which are resin combinations, containing no volatile materials, that are thermoplastic. Waxing papers was the earliest and is the most familiar application of this method of applying plastic coatings. Ethyl cellulose is the most commonly used material but there are many other resins that can be used such as vinyl acetate, cellulose acetate, and the polyamids. The gravure method with a temperature range of from 225 to 350°F. is the most popular procedure for this type of coating application.

The subject of emulsions was considered by Mr. Mosher who stated that this application appears to have unlimited possibilities. The fact that water is the solvent and is cheap and that high solids are obtainable makes it very desirable. However, since emulsions are colloidal systems, they are liable to break when contaminated by certain metals or acids, or extremes of heat or cold. However, since all normal resins can be emulsified and the mix used with such materials as casein or starch, this method has interesting possibilities.

The newer organisols and plastisols were discussed by Mr. Rich. These materials which are essentially an emulsion of a resin in an organic medium are prepared by milling. After application to the base sheet they must be subjected to temperatures of from 330 to 400°F. to bake the coating. Solids are high, 70 to 75 percent, and relatively cheap solvents such as mineral spirits or xylol can be used so that they can be considered to have interesting possibilities.

The questions were many and quite varied, which indicated that each problem in the application of a resin to paper is an entity and must be considered as such. When discussing the overall problem of plastic coating only generalities are possible and it was the concensus of all who attended this meeting that the speakers were to be commended for their presentations.

The following attended the January meeting of the New England Section: W. L. Foote, Paul D. Applegate, Jos. C. Pullman, Arthur M. Worthington, Jr., A. W. Oliner, Helen U. Kiely, Arthur M. Brooks, C. H. Child, Paul R. Nelson, Val Gooding, Pete Volanakis, Bill Cain, R. H. Mosher, H. P. Chase, G. W. Rothmeyer, W. S. Houston, F. C. Heywood, R. S. Bracewell, Dr. T. A. White, M. V. Crowell, Fred W. Bradley, R. T. Bingham, H. L. Mellen, E. Whitman Strecker, J. F. Wright, Ralph B. Millington, Charles P. Slocum, Elmer Daggy, Paul A. Donaghy, Fred W. Schneider, J. R. Kemmerley, Albert D. King, Ralph T. Nazzaro, Richard R. Lowell, Dr. Werner Kaufmann, Warren S. Kumblad, R. F. Blount, E. L. Kallander, Geo. Hebert, Robert Kennedy, F. E. Wilson, John P. Phelps, S. J. Quattrocchi, Fred Bolner, Ed. LaBelle, W. R. Hotin, George C. Schmid, P. L. Slayton, J. P. Bainbridge, H. A. Gray, I. V. Wilson,

(Continued on page 42)

ANNOUNCEMENT...

In order to concentrate the greatest possible attention on the growing field of aromatics for industrial purposes, and in order to develop fully the interest in new preservatives, stabilizers, germicides, anti-skinning agents, mildewcides and other industrial chemicals,

SINDAR CORPORATION

has been formed as a separate company to take over the activities formerly carried out by the Industrial Products Division of Givaudan-Delawanna, Inc.

During recent months, there has been an unprecedented display of interest in the utilization of odor as a merchandising aid. Manufacturers in scores of industries—rubber, textile, plastic, paint, paper and others—have sought aromatics, either for the purpose of imparting a pleasant, nose-catching fragrance, or to mask the objectionable odor caused by raw materials they were using.

Sindar Corporation will continue to sell the well-known industrial aromatics developed by Givaudan—including the Texodors*, Paintodors, Inkodors, at the same time lending its efforts to the development of new aromatics to meet the needs of industry.

Sindar Corporation will furthermore be engaged in the development and sale of the Bartyls* and other effective anti-skinning agents; Compound G-4 and Compound G-11, fungicidal and germicidal chemicals; and many stabilizers and preservatives.

The pioneers in industrial aromatics now take this giant stride forward, in the organization of the first company devoted principally to this field, in order better to serve American industry.

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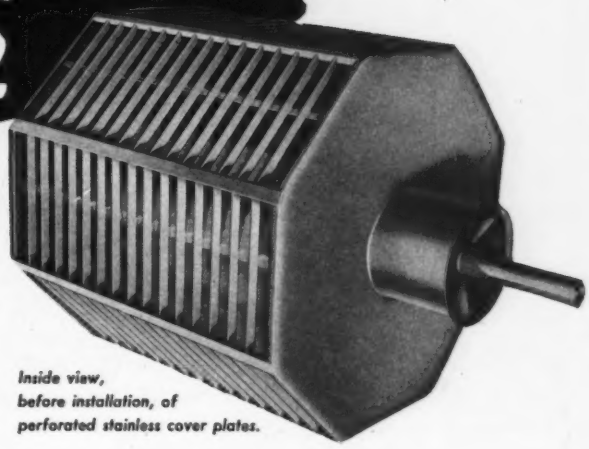
330 West 42nd Street • New York 18, N. Y.

Branches: Philadelphia, Boston, Los Angeles, Cincinnati, Detroit, Chicago, Seattle, Montreal, Toronto

Jones Stainless Steel CYLINDER WASHER RUNNER



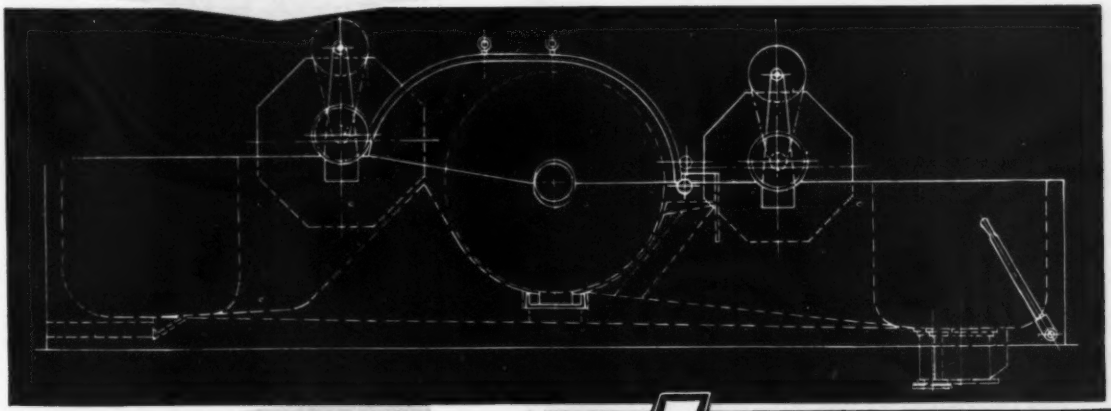
Inside view, before installation, of perforated stainless cover plates.

Here's an entirely new non-corrosive RUNNER for washing pulp, rag, and wood stock. Completely stainless steel, and easy to keep clean, to prevent contamination of stock. Designed to extract sufficient water . . . and provides many modern features to assure efficient, dependable washing.

Built to any size or capacity either as a new unit used with the latest Jones Washer, or as a replacement of your old washer runner.

Standard raising and lowering mechanism normally furnished. Available with hydraulically operated raising and lowering mechanism and also individual gear motor drives, as required.

Tell us your washer problem and we will send you full particulars with quotations.



DIAGRAMMATIC VIEW OF JONES CEMENT TUB WASHER

Jones

E. D. JONES & SONS COMPANY-PITTSFIELD, MASS.
Builders of Quality Machinery for Paper Mills

MANUFACTURERS AND DISTRIBUTORS IN CANADA WATEROUS LTD., BRANTFORD, ONT.

IMPORTS

NEW YORK IMPORTS

WEEK ENDING JANUARY 17, 1948

SUMMARY

Newsprint	10,993 rolls
Wallpaper	1 pcl.
Photo Paper	1 cs.
Emery Paper	5 cs.
Gummed Paper	56 cs.
Tissue Paper	25 cs.
Miscellaneous Paper	186 rolls, 8 cs.

NEWSPRINT

Malmar Paper Co., N. Amsterdam, Rotterdam, 198 rolls.

S. B. Behrens, N. Amsterdam, Rotterdam, 35 rolls.

N. Y. Journal American, Markland, Liverpool, N. S., 815 rolls.

N. Y. Herald Tribune, Markland, Liverpool, N. S., 1966 rolls.

N. Y. World Telegram, Markland, Liverpool, N. S., 709 rolls.

Brooklyn Eagle, Markland, Liverpool, N. S., 683 rolls.

Herald Statesman, Inc., Markland, Liverpool, N. S., 42 rolls.

Richmond Newspapers, Inc., Markland, Liverpool, N. S., 1769 rolls.

Price & Pierce, Ltd., Markland, Liverpool, N. S., 443 rolls.

Madden Reeve Angel & Co., Hesperus, Kotka, 196 pkgs., 1345 rolls.

Jay Madden Corp., Hesperus, Kotka, 250 rolls.

(———), Hesperus, Kotka, 72 rolls.

N. Y. World Telegram, Stuart Prince, Cornerbrook, 1165 rolls.

N. Y. Sun, Stuart Prince, Cornerbrook, 661 rolls.

Clinton Paper Corp., Stuart Prince, Cornerbrook, 840 rolls.

WALLPAPER

Penson & Co., Drottningholm, Gothenburg, 1 pcl.

PHOTO PAPER

(———), Sete Cidades, Ponta Delgada, 1 cs.

EMERY PAPER

Hammel & Riglander, Oregon, Havre, 5 cs.

GUMMED PAPER

B. F. Drakenfeld & Co., Black Prince, Liverpool, 56 cs.

TISSUE PAPER

B. F. Drakenfeld & Co., American Clipper, Liverpool, 25 cs.

MISCELLANEOUS PAPER

American Trading Co., Cape Fear, Yokohama, 7 cs.

Bank of The Manhattan Co., Drottningholm, Gothenburg, 105 rolls.

Chemical National Bank, Drottningholm, Gothenburg, 81 rolls.

Stevens Nelson Paper Corp., Oregon Havre, 1 cs.

RAGS, BAGGINGS, ETC.

New England Waste Co., Sally Maersk, Cochin, 136 bls. cotton waste.

(———), Black Prince, Liverpool, 2 bls. wool rags, 39 bls. wool thread waste.

Royal Manufacturing Co., Arkeldyk, Antwerp, 54 bls. cotton waste.

New England Waste Co., Ajax, Cochin, 150 bls. cotton waste.

New England Waste Co., Marine Leopard, Bombay, 250 bls. cotton waste.

Brqndwein Mazur, Marine Leopard, Bombay, 200 bls. cotton waste.

E. J. Keller Co., Inc., Marine Leopard, Bombay, 200 bls. old jute rags.

Schimmel Corp., Marine Leopard, Bombay, 100 bls. cotton waste.

Faiz & Co., Marine Leopard, Bombay, 74 bls. old jute rags.

Green Textile Associates, Inc., Grenanger, Santos, 413 bls. cotton waste.

Williamson Northrup Co., Inc., Grenanger, Santos, 126 bls. cotton waste.

New England Waste Co., Grenanger, Santos, 453 bls. cotton thread waste.

M. O. Schimmel Corp., Grenanger, Rio de Janiero, 145 bls. picker waste.

New England Waste Co., Grenanger, Rio de Janiero, 73 bls. cotton waste pickers, 29 bls. cotton linters.

Eastern Packing & Paperstock Corp., Stuart Prince, Cornerbrook, 233 bls. paperwaste.

Textile & Paper Supply Co., Grete Maersk, Shanghai, 100 bls. cotton waste.

S. H. Waldestein Co., Grete Maersk, Shanghai, 100 bls. cotton waste.

American Cotton Products Co., Grete Maersk, Shanghai, 200 bls. cotton waste.

Railway Supply & Manufacturing Co., Grete Maersk, Shanghai, 100 bls. cotton waste.

Riverside Mill, Grete Maersk, Shanghai, 200 bls. cotton waste.

Chase National Bank, Bartlesville Victory, Messina, 196 bls. old dark cottons.

E. J. Keller Co., Inc., Pierre Victory, Antwerp, 121 bls. old bagging.

Chase National Bank, American Clipper, Manchester, 23 bls. wool waste, 16 bls. wool rags.

GLUESTOCK, ETC.

H. Remis, Santa Luisa, Valparaiso, 72 bdls. gluestock.

H. Remis, Cape Cumberland, Barranquilla, 51 rolls gluestock.

Transatlantic Animal By-Products, American Clipper, Liverpool, 325 bags hidecuttings.

CASEIN

F. H. Paul & Stein Bros., Coastal Viking, Pt au Prince, 7 bags.

Mercantile Metal & Ore Corp., Tropero, Buenos Aires, 1000 bags (extra lactic).

WOODPULP

Pulp & Paper Trading Co., Drottningholm, Gothenburg, 600 bls. prime unbleached sulphite pulp.

Price & Pierce, Ltd., Markland, Liverpool, N. S., 2551 bls. unbleached sulphate pulp.

Reciprocal Pacts Go Into Effect

NEW YORK—Five of the Geneva Reciprocal Trade Agreements became effective January 1. All of the United States concessions on paper became effective on that date and concessions granted by other countries now effective are as follows:

Australia—"Primage" of 10 percent waived on Newsprint, Tissues, Coated Printing, Uncoated Printing, Writing, Glazed Imitation Parchment, Typewriting, not including Duplicating Paper, Wrapping, Greaseproof Wrapping, Imitation Greaseproof Wrapping, Fruit Wrapping, Cigarette Tubes and Papers for each 60 Cigarettes.

France—An entire change in tariff procedure has been effected with the setting up of a flat ad valorem system of assessing duties instead of the former system and compound rate system. A complete schedule of tariff rates has been fixed as follows: Greaseproof, Brown Groundwood Paper and Paperboard, all Chemical Pulp Papers, Lined Paper and Paperboard (without straw or kraft), Cellulose Wadding, Coated Paper (other than Baryta coated), Paper without Mechanical Pulp. Made on a Winding Machine (presumably including Kraft), 25 percent. The only apparent provision for writing paper is a 20 percent rate for paper containing 75 percent or more rag pulp. Straw papers are dutiable at 18 percent. Most others at from 18 to 25 percent.

Taking advantage of the "escape clauses" in its Reciprocal Trade Agreement, Mexico has cancelled 132 tariff concessions made to the United States. The old basis of assessment of duties has been changed from the specific rate based on pesos per kilogram to a compound rate of both specific and ad valorem rates. The changes are as follows:

Paper of the natural color of the pulp, weighing more than 50 but not more than 100 grams per square meter, from .14 peso per legal kilogram to .10 peso plus 20 percent ad valorem.

Similar paper weighing more than 100 grams, from .10 peso to .07 peso and 15 percent.

Paper of any kind, not specified, weighing up to 100 grams, cut in strips up to 10 centimeters in width, from .80 peso to .55 peso and 10 percent.

Paper weighing over 100 grams and cut into strips up to 10 centimeters, from .60 peso to .20 peso and 10 percent.

Paper, cut for the dressing table and the toilet, from .26 peso to .15 peso and 15 percent.

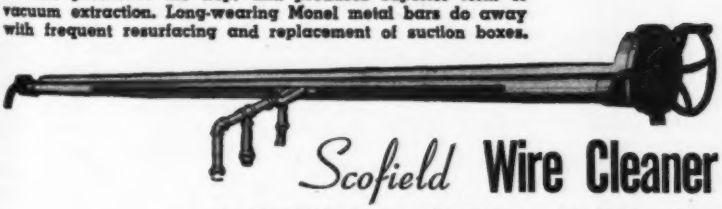
Speed Up Output
Cut Costs Per Ton
Soft, Clean Felts All the Time
The Scofield Way

Scofield Felt Conditioner

Operates AUTOMATICALLY. Eliminates fill-ups, insures greater uniformity, by removing destructive substances from felts. Maintains a clean, soft felt during production; quickly pays for itself in longer felt life, savings of paper stock, reduced shower water consumption.

Scofield Venturi Throat Suction

Venturi form of suction orifice avoids straight-down pinch pull on felt, preserves the nap, and produces superior form of vacuum extraction. Long-wearing Monel metal bars do away with frequent resurfacing and replacement of suction boxes.



Scofield Wire Cleaner

For Fourdrinier wires and cylinder moulds. Ejects a flushing mixture of steam and water, accurately controlled as to temperature, density and velocity. One turn of hand wheel moves the broad, thin spray 4" in cross-machine direction, quickly reaching spots and streaks.

Also High-Pressure Shower Pipes.

"From a single casting to a paper machine"

FROM complete paper machines down to the smallest miscellaneous items, Sandy Hill designs and engineers for greatest efficiency and economy. The Scofield equipment shown here is an example. The Sandy Hill line includes Screens, Grinders, Drives, Flow Control units, Rolls, Valves and many more items — all built to highest standards of precision and quality. The Sandy Hill engineering staff will be glad to discuss your problems with you.

WRITE FOR ILLUSTRATED FOLDERS

THE SANDY HILL IRON & BRASS WORKS
HUDSON FALLS, N. Y.

TRENDS

Office of the PAPER TRADE JOURNAL,
Wednesday, January 21, 1948.

Reporting on the global agreement for 1948 deliveries of Swedish pulp, SVENSK PAPERSMASSE-TIDNING writes that agreement has been reached in the preliminary conferences on the main principles, that "further inquiries are now being made and when these are completed the parties will meet again."

Also it informs that the "recently signed trade agreement for 1948 between Holland and Sweden provides for the export from Sweden of the same quantities of pulp as in 1947;" that a supplementary quota of 1,000 tons of sulphate pulp has been allotted to Denmark, and that negotiations for the new year's agreement as from February 1, 1948 are expected to begin very shortly; that "no announcements have been made regarding the now proceeding negotiations for an agreement with Italy which are of particular importance seeing that Italy is the leading market for Swedish viscose pulp."

The same periodical reports that supplies of bleaching agents are still inadequate, but the expansion of the chlorine factories in Sweden has nevertheless resulted in a fairly considerable total increase in the part of the output further processed by bleaching. Notwithstanding many threatening situations, it has been possible to arrange for sufficient supplies of salt cake to prevent the closing of any sulphate mills for lack of that raw material. The chemical pulp industry, it advises, has been let off relatively easy in the matter of rationing of hydro-electric power but that the mechanical pulp industry has been so badly hit that the majority of the mills can hardly reach more than half their normal output.

Newsprint

Mill stocks of newsprint at the end of December were 84,964 tons ahead of the previous December, the Newsprint Service Bureau reported. North American production for the month also for the year as a whole set new highs with the following production increases reported: Continental 7 percent, Canadian 7.3 percent, United States 7.1 percent and Newfoundland 3 percent.

Finland would be able to supply paper for cheaper newspapers and periodicals if the bulk of the paper were slightly raised is the belief of a Finnish writer, who also adds that Finnish-American trade would benefit were the stipulations for standard newsprint to be revised. Thirty percent of Finland's newsprint exports were to the United States in the 1930's, an item which seems now the most difficult to reintroduce. Consideration should be given to the fact, he writes, that the American press has repeatedly tried to obtain duty-free imports of glazed paper, also that Finland depends on large exports to the United States to fulfill her obligations which are to be repaid before 1976 in dollars, and a considerable portion of such exports will always be forest products.

1948 Aspects

Ten million tons or one-half the industry's yearly output is currently in paperboard, 600,000 tons of it is in paper shipping sacks, and approximately 425,000 tons in container board, with all three fields showing continuous and rapid development into a more flourishing future. To the million dollar business of packaging which by its fine arts appearance invisibly stamps each product "American-made," is now being extended the wide-open opportunities for American export trade which will require special packaging to withstand dampness and other climatic hazards, a field which has become more fertile with the introduction of the new VUS weatherproof board . . . The year is expected to show tremendous advances in the prepackaging of fruits and vegetables as well as meats and other commodities hitherto considered impractical. Small starts have met with much success in the large super markets in this country, and to a lesser degree in Canada where it is reported in the experimental stage only. It is the opinion of the trade here that a new era of packaging vegetables at the source becomes possible with the advent of weatherproof board for commercial use. Tremendous savings in freight can be effected by trimming away leafy waste before packaging; and spoilage and shrinkage caused by weather conditions and consumer handling will no longer be hazards . . . Holiday prepackaging extended itself to turkeys, Christmas trees, electric bulbs, hosiery, sheets and pillowcases. . . Going, going, gone, too, is the day of ordinary brown-paper wrapping and bagging of purchases. The direction is becoming pronounced for printed decorative papers, designated in the trade as packaging papers, which carry store advertising and eye-appeal . . . American ingenuity during the war's metal shortage produced fibre containers which carried an apologetic notation "temporary container." This stepchild has developed into a tremendous fibre-container and drum business for commodities ranging from adhesives, abrasives, creams, chemicals, colors, food products, emulsions, greases, insecticides, pharmaceuticals, textile products, to the larger sizes for moving household equipment, ranging from all-fibre to metal rims and wooden heads. Container board production for the first ten months of 1947 increased 12.6 percent over the like period of 1946, and new production underway is expected to be completed by next August.

Waste Paper

The very satisfactory year for the waste paper industry gives indication of being repeated for 1948, as the demand for high grades continues unabated and low bulk grades move steadily despite mill inventories laid up against seasonal slow periods of collections. Folded news and old corrugated were in brisk demand and mixed paper improved its position. Manila tabulating cards were stronger, other prices unchanged. The market is definitely stronger, as ice and snow continue to limit collections seriously.

Rags

The let-down in the rag-content field, reported in this column some weeks ago, is making itself felt by curtailed production as mills reduced their work week to effect a balance. Buying for new cotton cuttings is proceeding cautiously for immediate requirements only, and colored grades are reported somewhat softer. Prices are holding at firm prices as weather conditions slow supplies.

Demands for roofing improved, and prices are being maintained. Old rag collections from peddlers have almost ceased, and mixed rags are coming at a minimum flow. Interest in foreign rags is being expressed.

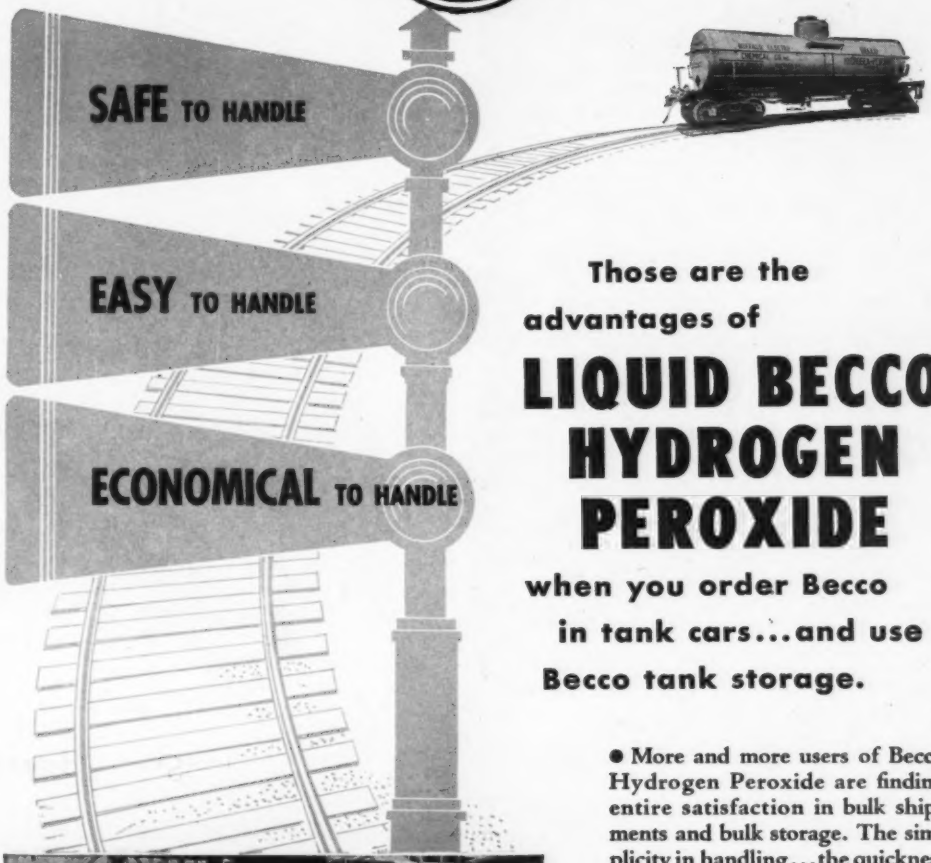
The market for old bagging is steady and firm, with the demand far in excess of forthcoming supplies. While prices of jute continue on such high level and the supply so short, prices of old bagging will be uncertain and are quoted as "nominal."

Index

The index of general business activity for the week ended January 10 rose to 155.8 from 153.3 in the preceding week, compared with 147.6 for the corresponding week of 1947. The index of paperboard production dropped to 184.5 from 190.4 in the previous week, compared with 184.6 in the corresponding week of 1947.

Paper production for the week ended January 10 was estimated at 100.3 percent compared with 100.3 (revised figure) in the preceding week, with 102.6 for the corresponding week of 1947, with 95.3 in 1946, and with 88.7 for 1945.

Paperboard production for the week ended January 10 was 99.0 percent of capacity, compared with 78.0 percent for the preceding week, with 102.0 for the corresponding week of 1947, with 94.0 for 1946, and with 95.0 for 1945.



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LIQUID BECCO HYDROGEN PEROXIDE

when you order Becco in tank cars...and use Becco tank storage.

● More and more users of Becco Hydrogen Peroxide are finding entire satisfaction in bulk shipments and bulk storage. The simplicity in handling...the quickness of transfer...adds greatly to production and subtracts substantially from costs. 40,000 lbs. in 1½ hours can be handled through the turning of a valve and the pushing of a button.

Becco's fleet of tank cars is the largest in the hydrogen peroxide industry. Becco's representatives will arrange and plan with you for the most efficient tank storage.

Write for complete information.

BECCO SALES CORPORATION

AGENTS FOR BUFFALO ELECTRO-CHEMICAL COMPANY, INC.

BUFFALO 7, NEW YORK

New York | Boston | Philadelphia | Chicago | Charlotte

MARKETS

BLANC FIXE—Market unchanged. Demand continues strong. Pulp is currently quoted at $85 in bags, car lots at works, 6 cents per lb., l.c.l., deld.; by-product $72.50 per ton, car lots at works, 6 cents per lb., l.c.l., deld.

BLEACHING POWDER—Active demand. Supply improves. Market near a balance. Prices range from $3.75 to $4 per 100 pound drums, l.c.l., works.

CASEIN—Market strong following price rise. Buying weak. Domestic production unsettled. Stocks inadequate. Current prices on processed acid precipitated casein at 33 to 35 cents per pound for domestic grades and 30 to 32½ cents for imported grades, f.o.b. shipping point.

CAUSTIC SODA—Supply tight with no visible sign of improved supply. Solid caustic is reported at $2.85 per cwt.; flaked and ground is quoted at $3.25 per cwt. in 400 pound drums, $3.75 per cwt. in 100 pound drums—car lots at works; liquid 50% in tank cars at $2.25 per cwt.; liquid 73% in tank cars at $2.35 per cwt. at works.

CHINA CLAY—Market steady. Domestic grades in good supply; filled, $10 to $13 per ton, car lots; coating clay is $15 to $30. Imported clay demand good. Supply improved. Quoted $16 to $35 short ton, export warehouse.

CHLORINE—Demand sustained. Supply condition unimproved. Tank car shortage hampering movement. Prices unchanged. Currently quoted at $2.25 per cwt. in single unit tank cars, and at $2.55 to $3.75 per cwt. in multi-unit tank cars, f.o.b. works.

ROSIN—Trading light. Prices firm. Gum rosin in drums per 100 pounds net in yard. New York car lots B, D, $9.75; E, F, $10.50; G, H, I, K, M, N, $10.75; WG, $11; WW, $11.10. Wood rosin, per 100 pounds, net, f.o.b., l.c.l., N.Y., B, $6.45; FF, $7.95; G, H, I, K, M, $10.51; N, $10.70; WG, $10.90; WW, $10.95; X, $10.96.

SALT CAKE—Demand continues ahead of supply with slight improvement in shipments. Prices unchanged. Domestic salt cake is quoted at $20 to $26.

SODA ASH—No early improvement in supply seen. Demand strong. Market tight. Shipments only against contracts. Current prices, car lots, per 100 pounds, are as follows: in bulk, $1.10; in paper bags, $1.30; and in barrels, $1.80.

SODIUM BICARBONATE — Supply approximately abreast the demand. Shortage of box cars delays shipment. Reported as $1.85 per cwt. paper bags, carload lots.

STARCH—Market strong and active following price rise. Production behind schedule; sold well ahead. Pearl grade quoted at $7.31 per 100 pounds, powdered starch at $7.42 per 100 pounds, car lots, New York.

SULPHATE OF ALUMINA — Supply steady. Prices unchanged. The commercial grades are quoted at from $1.15 to $1.30 per 100 pounds, in bags, car lots, f.o.b. works. Iron free is quoted at $2 per 100 pounds in bags, car lots, at works.

SULPHUR—Prices unchanged. Supplies ample. Annual contracts are quoted at $16 to $18 per long ton, f.o.b. mines; the price f.o.b. at Gulf ports is $17.50 to $19.50 per long ton.

TALC—No change in domestic market. Demand far in excess of supply. Domestic grades are currently quoted at $21 per ton in mines; Canadian at $35 and up per ton. All prices in car lots.

TITANIUM DIOXIDE—Extremely tight supply with no early easing seen. Demand strong. Anastase 17½c lb. carload lots, 18-18½c l.c.l.; rutile 19½c lb. carload lots, 20-20½c l.c.l.; 50-lb. bags, f.o.b. plant, minimum freight allowance.

filter runs in winter . . .

increased from 11.5 to 20 hours

Longer filter runs during winter months, and better color too, are reported by leading mills using N-Sol Process as a coagulant aid. The filtered water turbidity may be decreased from approximately 1.0 to 0.5.

N-Sol Processes are methods of reacting "N" Silicate with reagents to produce activated silica sol. This, combined with alum as a coagulant, forms a large, tough, dense and rapid settling floc for either horizontal or up-flow systems.

Mills welcome the N-Sol Processes for solving color removal problems, for increasing filter runs, and for decreasing filtered water turbidity.

PHILADELPHIA QUARTZ COMPANY

Dept. B, 121 South Third Street, Philadelphia 6, Pa.

Ask for free, handy file of bulletins and reprints describing activated silica sols in water treatment.

Here Were Made America's First Paper Boxes

In 1844 American jewelers were dependent on crude, costly imported paper boxes. Aaron Dennison of Boston decided that America needed a new industry, and that his father, Colonel Andrew Dennison, cobbler, of Brunswick, Maine, was just the man to start it. To Colonel Dennison, then 58, the idea of competing single-handed with European industries was a challenge. With his old shoe knife he cut out the parts from pasteboard and glazed paper. His daughters, Julia and Matilda, joined, pasted and finished the boxes, which found a ready market. Thus were made the first set-up paper boxes produced in America and thus began the Dennison Manufacturing Company.

Today, paper boxes of every shape, size and character have become indispensable in the conduct of American business. They have played an important part in making paper the product most used by man.

For information on the first set-up boxes made in America, we are indebted to the book, "Paperboard and Paperboard Containers," by Harry J. Bettendorf. A copy of "Paper — Pacemaker of Progress," published by F. C. Huyck & Sons as a tribute to the Paper Industry, will be sent free upon request.

F. C. HUYCK & SONS · *Kenwood Mills* · ALBANY, NEW YORK

KENWOOD WOOL PRODUCTS

HUYCK *Felts*

PRICES

With the elimination of price controls on paper, pulp, rags and other materials, the quotations given below once more become indicative of trends in an open market. At the moment they can be of little more, for, while some volume business still is being done under contract at the figures given below, fluctuations representing special conditions are too varied and too frequent to permit prices to be given as representing a wholly stabilized market.

Paper

(Delivered New York)

Standard News, per ton—

Roll, contract	—	to	$96.00
Sheets	—	"	109.00

Kraft—per cwt.—Carload Quantities
Zone A Deld. 40 lb. base wgt.

Superstandard Wrapping	$9.00	to	—
No. 1 Wrapping	6.75	"	7.50
Standard Wrapping	6.50	"	7.25
Standard Bag	6.00	"	7.00

Tissues—Per Ream 24x36 (480) 11 lb. Zone 1.

Wh. No. 1 Frd.	$1.75	to	$2.00
Wh. No. 1 M. G.	1.75	"	2.00
Wh. No. 1½	1.60	"	—
Wh. No. 2	1.55	"	—
Kraft Anti-Tar	1.38½	"	—
Kraft Unbl.	1.85	"	—
Manila No. 2	1.62	"	—

Toilet—Per Case of 100 rolls—1 M Sheets.

Unbleached	$5.50	to	$6.40
Bleached	6.50	"	7.60

Paper Towels—Per Case of 3750—Zone 1.

Wh. Jr. M'tif'd 9¼x9½	$4.85
Br. Sr M'tif'd 10x12	3.45
Br. Jr. M'tif'd 9½x9¼	2.95
Br. Jr. Sgl. fold 10x10¼	3.10

Manila—per cwt.—C. l. f. a.

No. 1 Jute Tag	$14.50	to	—
Reg. Jute Manila	13.25	"	$15.50
No. 1 Manila	9.75	"	—

Boards, per ton—

News	$92.50	"	—
Chip	90.00	"	—
Sgl. Ma. L1 Chip*	102.50	"	—
White Pat. Coated*	120.00	"	—
Kraft Liners 42 lb.	100.00	"	—
Binders Boards	126.00	"	—

* Base Prices per 10 tons. Less than 10 tons but over 3 tons, add $2.50; three tons or less, add $5; regular 35-39 basis, add $5; basis 40-49, add $2.50; basis 91-100, add $2.50; basis 101-120, add $5.

The following prices are representative of distributors' resale prices, all deliveries in Zone 1: Rag Content Bonds and Ledgers—

White, Assorted Items
Bonds, per cwt.

	Carton	4 C't'n	Ton
100% Rag Ext. No. 1	$55.00	$50.80	$48.70
100% Rag	48.25	44.55	42.70
75% Rag	38.00	34.55	33.10
50% Rag	31.50	28.75	27.50
25% Rag	28.00	25.50	24.50

Ledgers, per cwt.

100% Rag Ext. No. 1	$54.25	$50.00	$48.00
100% Rag	$47.50	$43.90	$42.10
75% Rag	37.50	34.55	33.10
50% Rag	32.25	29.40	28.25
25% Rag	28.75	26.15	25.10

Sulphite Bonds and Ledgers—
White, Assorted Items
Bonds, per cwt.

No. 1	$20.75	$18.75	$18.25
No. 2	19.75	17.75	17.25
No. 4	19.00	17.25	16.50

Ledgers, per cwt.

No. 1	$21.75	$19.60	$19.10
No. 2	20.75	18.75	18.05
No. 4	19.20	18.15	17.35

Tree Sheet Book Papers—
White, Cased Paper

(Per cwt.)	Case	Ton
No. 1 Glossy Coated	$20.40	$19.55
No. 2 Glossy Coated	19.15	18.30
No. 3 Glossy Coated	18.40	17.60

(Per cwt.)	Case	Ton
No. 1 Antique (Watermarked)	$15.90	$15.15
No. 2 Offset	14.15 to 17.90	13.65 to 17.10
A Grade E. F.	14.90	14.25
A Grade S. & S. C.	15.40	14.65
B Grade E. F.	Nominal	
B Grade S. C.	Nominal	

Wood Pulp

Domestic mill contract prices delivered with varying freight allowances.

	Per Short ADT
Groundwood	$80.00 to $81.00
Unbleached Sulphite	125.00 " 126.00
Bleached Sulphite	125.00 " 135.00
Bleached Soda	125.00 " 130.00
Bleached Sulphate	175.00 " 185.00
Unbleached Sulphate Northern	125.00 " 132.50
Unbleached Sulphate Southern	125.00 " 132.50

Canadian Quotations

Prices delivered with varying freight allowances unless otherwise specified:

	Per Short ADT
Reg. No. 1 Kraft	125.00 " —
Unbleached Sulphite	125.00 " 126.00
Bleached Sulphite	125.00 " 135.00
Glassine Unbleached Sulphite (no freight allowance)	120.00 " —
Bleached Soda	130.00 " —
Groundwood	80.00 " 85.00
Sideruns Pulping News	80.00 " —
Hardwood and Specialty Grades	Nominal

Swedish Quotations
On dock, Atlantic Ports

	Per Short ADT
Bleached Kraft	175.00 " 185.00
Bleached Sulphite	175.00 " 185.00
Unbleached Sulphite	157.50 " 175.00
Unbleached Kraft	140.00 " 165.00

Finnish Quotations
On dock, Atlantic Ports

	Per Short ADT
Bleached Sulphite	$185.00 to —
Unbleached Sulphite	155.00 " 157.00
Unbleached Sulphate	147.50 " —

New Domestic Cotton Cuttings

(F.O.B. Shipping Point Plus Dealer's Commission)

White Shirt	$12.00 to	—
Light Silesias	9.00 "	—
Unbleached Muslin	12.00 "	—
White Back Blue Overalls	9.00 "	9.25
Blue Overalls	8.00 "	—
Fancy Shirt	6.00 "	—
Light Percales	8.50 "	—
Light Prints	7.50 "	—
No. 1 Washables	5.00 "	—
Bleachable Khaki	7.00 "	7.50
Unbleachable Khaki	6.00 "	6.50
Cottonades	5.50 "	5.75

Old Domestic Cotton Rags

(F.O.B. Shipping Point Plus Dealer's Commission)

	Per 100 lbs.	
No. 1 Whites Repacked	$5.00 to	—
No. 1 Whites Miscellaneous	4.00 "	—
No. 2 Whites Repacked	3.50 "	3.75
No. 2 Whites Miscellaneous	3.00 "	—
Blue Overalls	3.75 "	—
Thirds and Blues Repacked	3.25 "	—
No. 1 Roofing Rags	1.90 "	2.00
No. 2 Roofing Rags	1.75 "	—
No. 3 Jute Bagging	1.60 "	—
No. 4 Brussels and hard back carpets	1.60 "	—
No. 5A Roofing Rags	1.80 "	—

New Foreign Cotton Cuttings

(Prices to Mill, F.O.B. Dock, N. Y.)

	Per 100 lbs.	
New Dark Cuttings	$5.50 to	$5.75
New Mixed Cuttings	6.25 "	6.50
Light Silesias	9.25 "	9.50
Light Flannelettes	9.25 "	9.50
New White Cuttings	12.00 "	—
New Unbleached Cuttings	12.25 "	—
Fancy Shirt Cuttings	6.50 "	7.00
Light Prints	7.75 "	8.00
Bleachable Khaki, No. 1	7.00 "	7.50
Unbl. Khaki, No. 1	6.25 "	6.75

Old Foreign Rags

(Prices to Mill, f.o.b. dock, N.Y.)

	Per 100 lbs.	
No. 1 White Linens	$14.00 to	16.00
No. 2 White Linens	12.00 "	13.00
No. 3 White Linens	8.00 "	9.00
No. 4 White Linens	8.00 "	9.00
No. 1 White Cottons	8.00 "	10.00
No. 2 White Cottons	7.00 "	8.00
No. 3 White Cottons	6.00 "	6.50
No. 4 White Cottons	4.00 "	4.50
Extra Light Prints	7.50 "	8.00
No. 1 New Light Prints	6.25 "	6.75
Med. Light Prints	5.25 "	5.75
Dutch Blue Cottons	5.25 "	5.50
Checks and Blues	4.00 "	4.25
Linsey Garments	3.00 "	3.75
Dark Cottons, European	2.20 "	2.60
Dark Cottons, Egyptian	1.75 "	2.00
Old Shopperies	2.50 "	3.00
New Shopperies	2.50 "	3.00

Bagging

(Prices to Mill, f.o.b. N. Y.)

	Per 100 lbs.
Foreign Gunny, No. 1	$5.75 to $6.00
Domestic Gunny, No. 1	6.25 " 6.50
Light Wool Tares	6.00 " 6.25
Heavy Wool Tares	6.00 " 6.25
No. 1 Scrap Bagging	6.00 " 6.25
Foreign Manila Rope	6.00 " 6.75
Domestic Manila Rope	5.75 " 6.50
Jute Strings	5.00 " 5.25
No. 1 Sisal Strings	5.25 " 5.50
Mixed Strings	1.75 " 2.50
Mixed Strings, Outthrows	.90 " 1.10

Waste Paper

Base Prices to Mills for Average Packings

(Dollars Per Ton)
F.o.b. New York, Baled

No. 1 Hard White Envelope Cuts, one cut	155.00 to 165.00
No. 1 Hard White Envelope Cuts	145.00 " 155.00
No. 1 Hard White Shavings, unruled	145.00 " 155.00
No. 1 Hard White Shavings, ruled	110.00 " 130.00
Soft White Shavings, one cut	145.00 " 155.00
No. 1 Soft White Shavings	135.00 " 145.00
Soft White Shavings, Misc.	125.00 " 135.00
No. 1 Fly Leaf Shavings	45.00 " —
No. 1 Groundwood Fly Leaf Shaving	35.00 " —
No. 1 Heavy Books & Magazines	27.00 " —
Mixed Books	15.00 " 20.00
No. 1 White Ledger	85.00 " 90.00
New Manila Envelope Cuttings, one cut	100.00 " 110.00
New Manila Envelope Cuttings	65.00 " 75.00
Extra Manilas	25.00 " 30.00
Mixed Kraft, Env. & Bag Cuttings	75.00 " 85.00
Kraft Envelope Cuttings	110.00 " —
Triple Sorted, No. 1 Brown Soft Kraft	65.00 " 75.00
New Kraft Corrugated Cuttings	85.00 " 90.00
No. 1 Assorted Old Kraft	55.00 " 60.00
New Jute Corrugated Cuttings	27.00 " —
Old 100% Kraft Corrugated Containers	45.00 " 50.00
No. 1 News	13.00 " 15.00
No. 1 Mixed Paper	11.00 " 13.00
Box Board Cuttings	12.00 " 14.00
White Blank News	75.00 " 80.00
Overissue News	18.00 " 20.00
Old Corrugated	21.00 " 23.00
Mill Wrappers	22.00 " 25.00

Twines

All Prices Nominal, F.o.b. Mill

(Soft Fiber)

Coarse Polished— India	.31¼	to	.32½
Fine India	.33¼	"	.37½
Fine Polished— Unpolished—			
Paper Makers	.27	"	.28½
Tube Rope	.27¼	"	.29½
Wrapping	.32	"	.34
Cotton	.55	"	.70

(Hard Fiber)

Mex. Sisal	.21	"	.31
Manila (Reprocessed)	.28	"	.30

(American Hemp)

Polished Hemp	.36¼	"	.42
Unpolished	.29½	"	.34

PHILADELPHIA

Domestic Rags (New)

(F.O.B. Eastern Shipping Point)

Shirt Cuttings— New White No. 1	.11	to	.12
New White No. 2	nominal		
Light Silesias	.07½	"	.08
Black Silesias, soft	.06½	"	.07
New Unbleached	.10½	"	.11¼
Washable Prints	.06½	"	.07
Washable No. 1	.05	"	.05½
Blue Overall	.07½	"	.08
Cottons—According to grades— Washable Shredding	.03½	"	.04
Fancy Percales	.06¼	"	.07¼
New Black Soft	nominal		
Khaki Cuttings— Unbleachable Cotton Cuttings	.06	"	.06½
Bleachable Cotton Cuttings	.07	"	.07½
Men's Corduroy	.05½	"	.06
Ladies' Corduroy	.05	"	.05½
Cottonades	.05½	"	.06

Domestic Rags (Old)

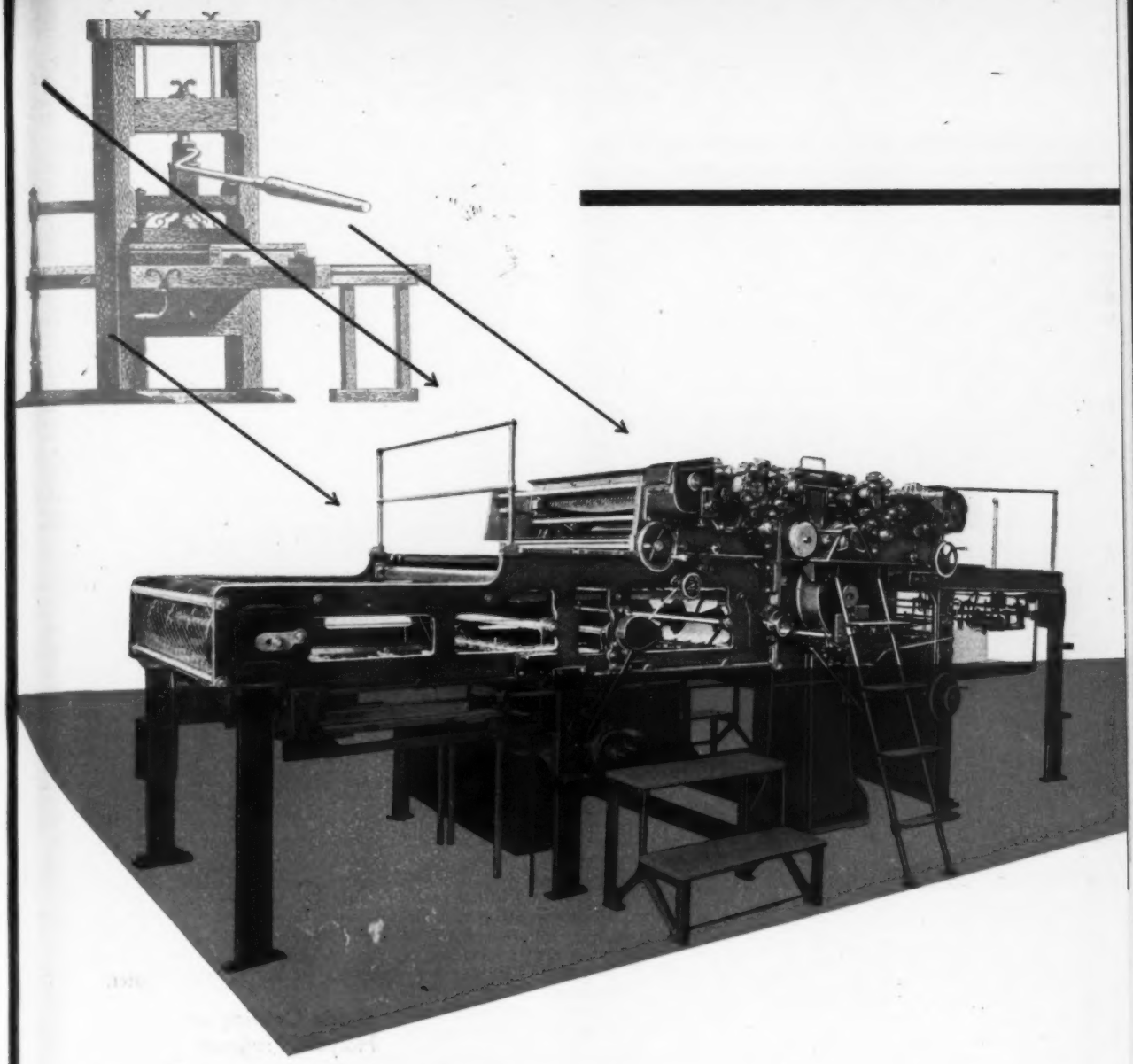
(F.O.B. Eastern Shipping Point)

White No. 1—Repacked	4.50	to	5.00
Mixed White	4.00	"	4.33
White No. 2—Repacked	3.50	"	3.75
Thirds and Blues— Miscellaneous	2.25	"	2.50
Repacked	2.75	"	3.00
Roofing Stock— Foreign No. 1	nominal		
Domestic No. 1	1.85	"	1.90
Domestic No. 2	1.75	"	1.80
Roofing Bagging	1.65	"	1.70
Old Manila Rope	6.25	"	6.50

Bagging

(F.O.B. Eastern Shipping Point)

Gunny No. 1— Foreign	nominal		
Domestic	4.75	to	5.25
No. 1 Clean Bright— Sisal Strings	.04½	"	.05
No. 2 Clean Bright— Sisal Strings	.03½	"	.04
Sisal Jute	.02¾	"	.03
Scrap— No. 1	5.00	"	5.50
No. 2	2.50	"	3.00



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When Stephen Daye set up the first printing press in this country he pioneered an industry that is essential to every industry today. And the same basic principles he utilized in operating his original flat bed press are utilized in a vastly expanded way in modern high-speed, multicolored rotary presses. In producing for the first time in this country various electro-chemical products, Niagara also pioneered an essential industry . . . and has continually improved the quality and utility of its products. Thus Niagara is today . . . "An Essential Part of America's Great Chemical Enterprise."

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LIQUID CHLORINE • CAUSTIC POTASH • CARBONATE OF POTASH • PARADICHLOROBENZENE • CAUSTIC SODA • NIAGATHAL (TETRACHLORO PHTHALIC ANHYDRIDE)

Wool Tares, heavy	4.75	"	5.00
New Burlap Cuttings	6.00	"	6.50

Old Papers

(F. o. b. Phila.)
Mill Prices, Baled

No. 1 Hard White Envelope Cuts, one cut	$100.00	to	$115.00
No. 1 Hard White Shavings, unruled	100.00	"	—
Soft White Shavings, one cut	90.00	"	95.00
White Blank News	70.00	"	75.00
Soft White Shavings	80.00	"	—
No. 1 White Ledger	85.00	"	90.00
Ledger, Colored	70.00	"	72.00
No. 1 Heavy Books & Magazines	24.00	"	26.00
Overissue Magazines	nominal		
New Manila Envelope Cuttings	80.00	"	—
No. 1 Assorted Old Kraft	60.00	"	65.00
No. 1 Mixed Paper	11.00	"	12.00
Box Board Cuttings	10.00	"	11.00
Kraft Corrugated Cuttings	90.00	"	100.00
Old Corrugated	24.00	"	26.00
Overissue News	20.00	"	22.00
No. 1 News	13.00	"	15.00

BOSTON

Old Papers

(F.o.b. Boston)
Mill Prices, Baled

No. 1 Hard White Shavings, unruled	6.25	to	6.75
No. 1 Hard White Shavings, ruled	6.00	"	6.50
Soft White Shavings, Misc.	5.25	"	5.50
No. 1 Fly Leaf Shavings	1.75	"	1.85
No. 2 Fly Leaf Shavings	1.65	"	1.75
No. 1 Groundwood Fly Leaf Shavings	1.75	"	2.00
No. 2 Groundwood Fly Leaf Shavings	1.50	"	1.75
Mixed Colored Shavings	2.00	"	2.25
New Manila Envelope Cuts, one cut	4.50	"	4.75
Hard White Envelope Cuts, one cut	6.00	"	6.50
Triple Sorted No. 1 Brown Soft Kraft	3.75	"	4.00
Mixed Kraft Env. & Bag Cuttings	4.00	"	4.25
Kraft Envelope Cuttings	3.75	"	4.00
No. 1 Heavy Books & Magazines	1.25	"	1.75
New Manila Envelope Cuts, one cut	—	"	—
New Manila Envelope Cuttings	4.00	"	4.25
White and Colored Tabulating Cards	4.00	"	4.50
Groundwood Tabulating Cards	1.50	"	1.75
White Blank News	2.25	"	2.50
No. 1 Assorted Old Kraft	3.50	"	—
No. 1 Mixed Paper	.65	"	.75
Overissue News	1.00	"	1.25
Box Board Cuttings	.60	"	.70
New Corrugated Cuttings, Kraft	2.75	"	3.00
Old Kraft Corrugated Containers	1.75	"	—
Old Corrugated Containers	1.10	"	1.25
Jute Corrugated Cuttings	1.07½	"	—
Paper Strings	2.00	"	2.25

Bagging

(F. o. b. Boston)

Gunny Bagging—			
Foreign	—	to	4.75
Domestic	—	"	4.75
Sisal Rope No. 1	6.00	"	—
Sisal Rope No. 2	5.50	"	—
Mixed Rope	5.25	"	—
Mixed Strings	2.00	"	2.50
Transmission Rope—			
Foreign	(nominal)		
Domestic	3.00	"	3.50
Manila Rope—			
Foreign	(nominal)		
Domestic	6.25	"	—
Soft Jute Rope	5.00	"	5.25
Jute Carpet Threads	6.00	"	—
Bleachery Burlap	8.50	"	9.00
Scrap Burlap—			
Foreign	—	"	4.75
Domestic	—	"	4.87½
South America	5.25	"	—
Wool Tares—			
Foreign	4.75	"	—
Domestic	4.75	"	—
Aust. Wool Pouches	5.00	"	5.25
New Zealand Wool Pouches	5.25	"	5.50
New Burlap Cuttings	6.00	"	6.50
Heavy Baling Bagging	5.25	"	5.75
Paper Mill Bagging	3.50	"	3.75
No. 1 Roofing Bagging	1.75	"	—

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints	.08	to	—
Fancy Percales	.07½	"	.08
New White No. 1	.11	"	.11½
New Light Flannelettes	.08	"	.08½
Canton Flannels, Bleached	.10	"	.11
Underwear Cutters, Bleached	.10	"	.11
Underwear Cutters, Unbleached	.11	"	.12
Silesias No. 1	.08	"	.08½
New Black Silesias	.05	"	—
Red Cotton Cuttings	.05	"	—
Blue Overalls	.08½	"	.09
Soft Unbleached	.11	"	.12
Blue Cheviots	.08½	"	.09
Fancy	.06	"	—
Washable	.06	"	—
Khaki Cuttings	.06½	"	.07½
Corduroy	.03½	"	—
Khaki Canvas	.06½	"	.06½
B. V. D. Cuttings	.10½	"	.11½

Domestic Rags (Old)

(F. o. b. Boston)

White No. 1—			
Repacked	3.80	to	—
Miscellaneous	3.20	"	—
White No. 2—			
Miscellaneous	2.65	"	—
Twos and Blues, Repacked	2.20	"	—
Old Blue Overalls	2.25	"	2.50
Thirds and Blues, Repacked	2.20	"	—
Miscellaneous	1.80	"	—
Black Stockings	3.50	"	4.00
Roofing Stock—			
No. 1	2.00	"	—
No. 2	1.75	"	2.00
No. 3	1.35	"	—
No. 4	1.35	"	—
No. 5, Quality A	1.35	"	—
Quality B	1.20	"	—
Quality C	.95	"	—
Old Manila Rope	6.00	"	—

Foreign Rags

(F. o. b. Boston)

Canvas	(nominal)
Dark Cottons	(nominal)
Dutch Blues	(nominal)
New Checks and Blues	(nominal)
Old Fustians	(nominal)
Old Linsey Garments	(nominal)
New Silesias	(nominal)

CHICAGO

Waste Paper

(F. o. b. Chicago)
Mill Prices, Baled

Shavings—			
No. 1 Hard White Envelope Cuts, one cut	$110.00	to	$120.00
No. 1 Hard White Shavings, unruled	105.00	"	115.00
No. 1 Soft White Shavings	80.00	"	95.00
No. 1 White Ledger	55.00	"	65.00
No. 1 Heavy Books & Magazines	40.00	"	42.00
White Blank News	65.00	"	—
Mixed Kraft Env. & Bag Cuttings	75.00	"	85.00
No. 1 Assorted Old Kraft	45.00	"	55.00
Overissue News	28.00	"	—
No. 1 News	17.00	"	19.00
No. 1 Mixed Paper	13.00	"	14.00
Old Corrugated	20.00	"	—
Mill Wrappers	22.00	"	—

Pennsalt Sets Up New Assignments

PHILADELPHIA, Pa.—Assignment of new territories to two field sales representatives of the heavy chemicals division of the Pennsylvania Salt Manufacturing Company, has been made public by R. S. Roeller, field sales manager, E. G. Warren, formerly a representative in the Philadelphia area, has been transferred to the Northern Ohio and Northwestern Pennsylvania territory, and C. Harvey Anderson has been shifted from Chicago to the Wisconsin and Minnesota territory.

A. C. Jones, manager for the past several years of Pennsalt's order and warehousing division, has returned to his former position as a sales representative in the Philadelphia area. Mr. Jones has been with Pennsalt since 1919.

Harold S. Davenport, of Pottstown, Pa., a graduate of Williams College, has joined the Division and now is undergoing training at the Philadelphia office.

Thomas W. Cox has been appointed assistant secretary of Pennsalt by Warner R. Over, secretary and treasurer. The appointment of Mr. Cox follows the retirement of U. Grant Beath, assistant secretary and assistant treasurer, after 47 years' service with the company. Mr. Cox, who joined Pennsalt in 1903, has been an assistant treasurer since September, 1944. He will continue as an assistant treasurer in addition to assuming his new post.

Mr. Over also published the appointments of Stanley L. MacMillan, who is in charge of the department's cost accounting, as assistant treasurer; and Joseph Doherty as credit manager of the company. Mr. Beath had also functioned as credit manager. E. J. Harrington, Jr., as assistant treasurer, will act as manager of the sales accounting division.

N. Y. U. Offers Course In Paper Merchandising

NEW YORK—New York University's Division of General Education will conduct an evening course on "The Marketing and Sales of Paper and Paper Products" beginning February 11, according to Dean Paul A. McGhee. J. Ronald Atwater, assistant to the president of the Mead Sales Company, of New York, will be chairman of the course.

Designed essentially for businessmen engaged in the manufacturing, converting, jobbing and buying of paper and paper products, the course will be presented in fifteen sessions held each Wednesday night at the Barbizon-Plaza Hotel from 6:00 to 7:45 p.m.

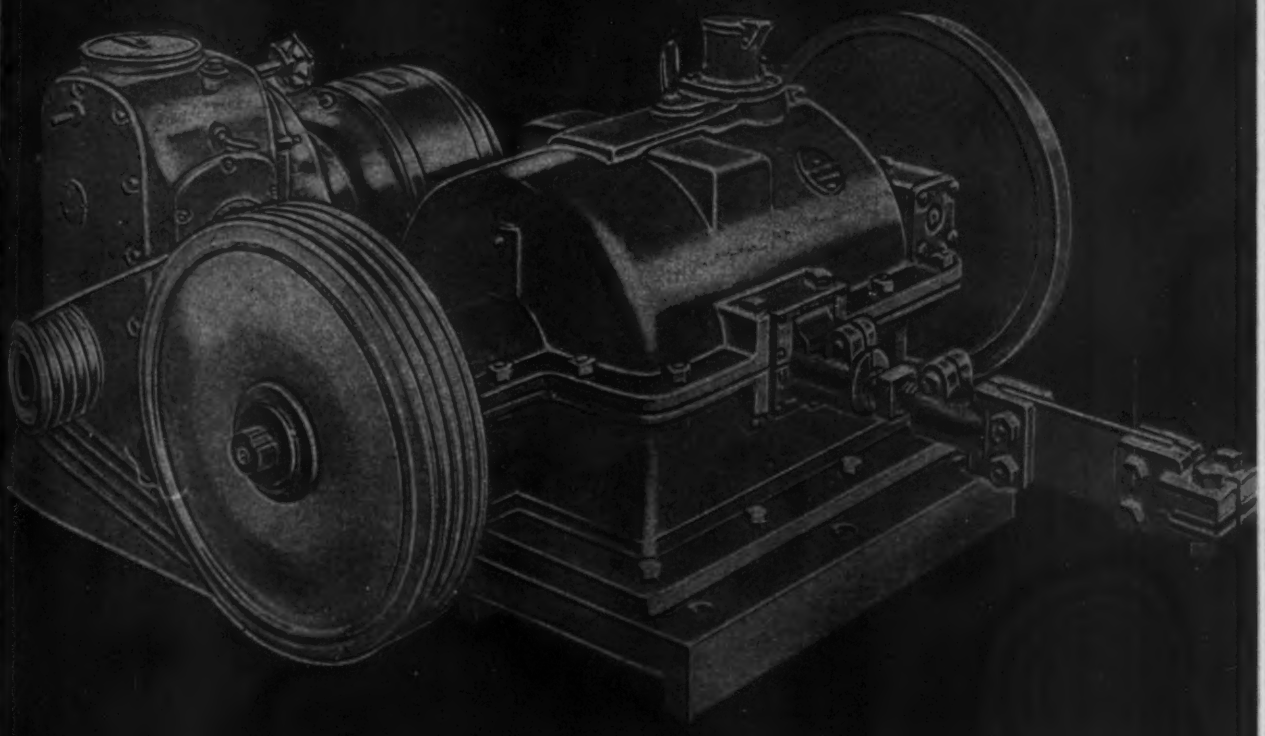
Among the lecturers scheduled to speak are E. W. Tinker, executive secretary, American Paper and Pulp Association; Hubert S. Foster, Mead Sales Company; Egmont Arens, prominent industrial designer; Jay Huss, National Paper Trade Association; Willard Leathers, National Paper Trade Association; George Johnson, Elof Hansen, Inc.; Pierre Loddengaard, United Paperboard Company, and John Barry, Dun and Bradstreet.

Plastic Coating on Holyoke Program

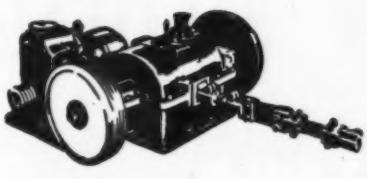
(Continued from page 32)

Andrew L. Smith, Howard Armstrong, L. A. Schlapfer, Jr., R. N. Thompson, S. L. Guastella, F. E. Pendleton, A. A. Svens, G. L. Carter, J. M. Booth, S. E. Swanson, Glendon A. Soule, Elbert C. Shaw, John A. Pollock, Malcolm S. Burgess, J. Mathews, D. H. Gutermann, R. E. Kilty, O. C. Kees, J. G. Bullard, W. E. Hamilton, E. O. Nash, C. E. Snook, W. Perron, N. Loughry, E. LaVergne, C. K. Genge, John Rich, N. E. Dupee, Jr., C. I. Horton, W. L. Craig, E. M. Brennan, E. Ekholm, R. B. Lombard, Dr. J. J. Thomas, Paul C. Yoder, L. A. Dow, F. A. Rideout, B. R. Goodwin, T. R. Probst, Richard Tutt, A. L. Perry, Al Cosby, C. F. Collins, S. Nowlan, A. Landry, F. Comery, F. Wilcox, H. A. Wells, J. Doyle, E. Kelly, R. P. Cook, C. L. Smith, Roy Charron, H. Maeder, R. Fowler, Alden Holt, C. Woodcock, Ann M. Brown, Peggy Dean, A. G. Dreis.

SIMPLEX SHAKES



SELF-CONTAINED, COMPACT, VARIABLE SPEED



This is the most compact, self-contained shake in use today. By installing two or three of these simplex units, the fourdrinier may be given varying degrees of shakes at different points along the forming table. This permits control of water carried on the wire and improves formation. Adjustment of speed and stroke can be made while machine is running.

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DIGESTED

Engineers are said to be more honest than most men because they are trained to think exactly. Their knowledge is expressed in precise, concrete terms. They rarely use general terms. They are more apt to express facts with full figures and fractions or decimals. Selling is one aspect of living. The engineer lives in a mathematical world where he has grown, from simple mathematics through algebra to geometry, trigonometry, calculus. The salesman lives and prospers as he conforms to the immutable principles of psychology. In the field of psychology there are so many variables and so much indifferent thinking without a distinctive definition of principle that the average salesman is apt to think of psychology as a nebulous science; but your speaker has on occasion sought out many professors of psychology and out of a full life devoted to selling, it is my belief that the salesman must possess contagious enthusiasm. He must know his product because out of knowledge and admiration grows enthusiasm. It must also be contagious which is the vitamin that the prospect first admires, comes to know, and eventually desires to possess.—EZRA W. CLARK, from an address before the Conference on Materials Handling, January 12, 1948 at Cleveland, Ohio.

Production Ratio Report*

(Production as per cent of six-day capacity)

COMPARATIVE WEEKLY SUMMARIES

Current Weeks—1947		Corresponding Weeks—1946	
December 6	112.1	December 7	106.6
December 13	110.1	December 14	106.7
December 20	110.6	December 21	101.8
December 27	74.9	December 28	71.8
January 3, '48 (Revised)	100.3	January 4, 47	96.3
January 10, '48	*100.3*	January 11, '47	102.6

COMPARATIVE MONTHLY SUMMARIES

1946				1947			
Jan.	94.7	July	94.0	Jan.	102.1	July	93.5
Feb.	98.4	Aug.	104.7	Feb.	105.9	Aug.	104.2
Mar.	104.4	Sept.	101.3	Mar.	106.1	Sept.	102.0
Apr.	102.7	Oct.	106.4	Apr.	105.1	Oct.	109.5
May	100.7	Nov.	105.5	May	106.2	Nov.	109.3
June	104.6	Dec.	97.0	June	106.0	Dec.	101.5
		Year Avg.	101.1			Year Avg.	*104.3*

COMPARATIVE YEARLY SUMMARIES

	1941	1942	1943	1944	1945	1946	1947
Year Average	97.4	90.4	87.8	88.1	89.4	101.1	*104.3*

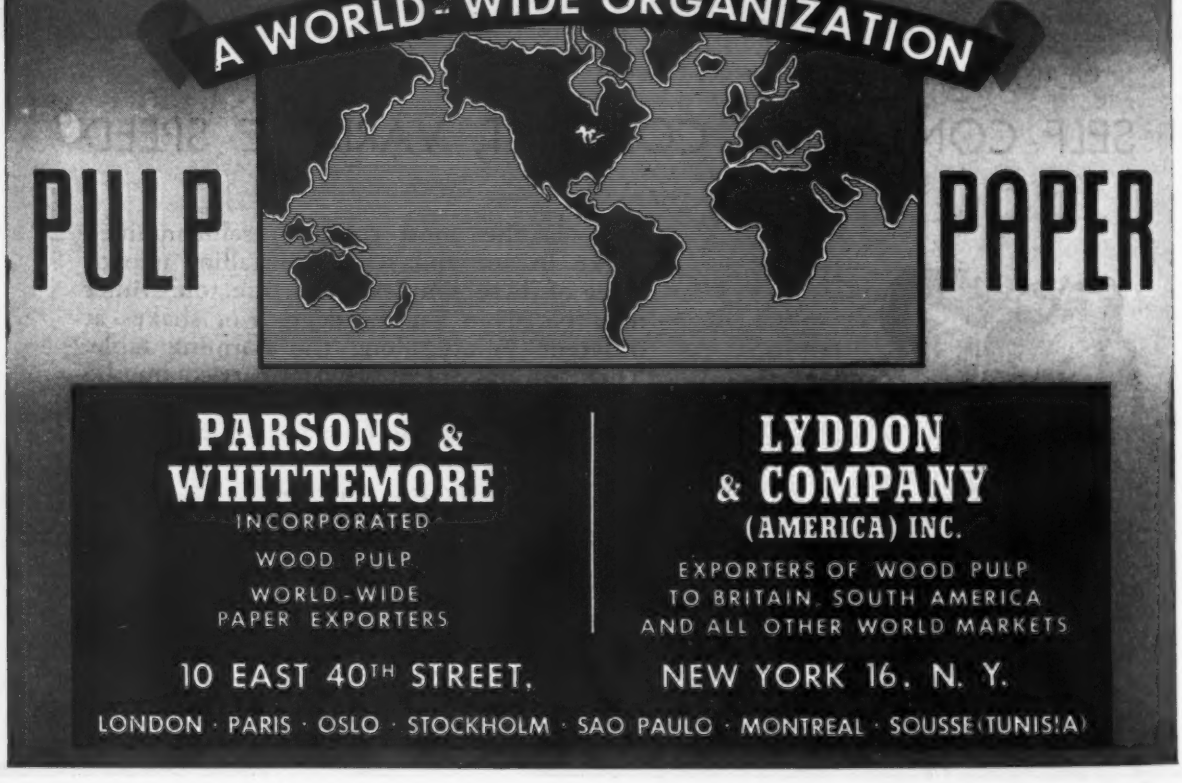
PAPERBOARD OPERATING RATIOS†

Current Weeks—1947		Corresponding Weeks—1946	
December 6	98	December 7	99
December 13	100	December 14	102
December 20	100	December 21	102
December 27	77	December 28	66
January 3, '48	78	January 4, '47	85
January 10, '48	99	January 11, '47	102

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct	Nov.	Dec.	Year Avg.
1946	90	91	100	99	94	97	89	99	96	100	99	92	96
1947	99	103	101	100	101	101	90	99	96	101	99	89	*98*

* Based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available. Does not include mills producing newsprint exclusively.

† Per cents of operation based on "Inch-Hours" reported to the National Paperboard Association.



EDITORIAL

"Thank You"

Some things can be so old and well tried and allowed to sink into a state of neglect thereby that a restatement of their truths may be classed as news of the first order. Particularly when they are taken out of storage and exhibited against a background of today's problems. The quaint old custom of thanking a customer for an order is one of these, it would appear. At least it was an impressive point in an informal talk that was made recently to a group of paper salesmen in New York.

The speaker was F. Henry Savage, sales manager of the book and bond paper division of the International Paper Company. The occasion was one of those family gatherings of officers and salesmen of the Milton Paper Company, metropolitan distributor for a well-varied line of quality papers, which have become an institution in the Milton campaign for better and firmer business. The talk was entirely intimate, much of it was of purely confidential interest. But some portions of it deserve widespread distribution for its salutary effect on the business of selling paper in the months and years that lie ahead.

"The recent period of paper shortage" he declares, "has been a binge, not a honeymoon—and it's necessary to start acting now to avoid the headaches that may follow." Paper salesmen who have regularly called on their accounts and tried to help them during the emergency, are a step ahead of the field according to Mr. Savage, who stressed that although the paper supply still may be low, paper salesmen must nevertheless make the rounds. "If your contacts have been neglected, start to repair them before it's too late," was his recommendation.

With this as general advice he went on to offer his little group some advance merchandising advice. The future of the paper business looks excellent to him—paper consumption per person is rising, and so is the birthrate. But "the trouble with the paper business is that it works too much on what happened in the past," Mr. Savage said. "People believe that just because certain business methods were used in former years, they should be continued now." He reviewed pre-war practices when paper merchandising depended on huge stocks of varying sizes and weights. "In those days printers wanted a certain size or weight, the salesmen took their orders, and the mill made them up—regardless of whether or not the order could be filled economically." He struck home the point that these practices are uneconomical for all concerned, and a more intelligent, business-like system is necessary—can be profitable.

"The answer," the speaker declared, "is standardizing. Salesmen must get across the message to printers, that printers and their customers, and paper merchants and their suppliers, will all be better off with standard sizes, weights and finishes." He recommended that unless they can be produced economically, special weights and sizes of paper should rarely be made up. Instead, the salesmen should sell the items that the house has available, and economies will result for all users and sellers.

"Know your competition," preached Mr. Savage. "Always know what they have up their sleeves that you don't have up yours." He reiterated that salesmen must constantly be aware of all competitive practices and must keep their firm well informed on them. "If you find that a grade of paper suffers competitively, feed that information to the management. They will heed your suggestion, support your claims, and ultlimately give you a better product to sell. This will lead to bigger commissions for you—and better paper for your customers."

"People wonder why salesmen's salaries differ. The difference is that some are business getters and others are business keepers. A lot of the business keepers can become business getters by using new, proven sales methods." One of these methods is the exchange of accounts. He stated that no man is good to a company if he holds on to an account that he cannot sell—and "not everybody can sell every account." To combat this truism, Mr. Savage recommended frequent sales meetings to review inactive accounts and trade them off among the salesmen.

When the house is suffering because salesmen are hanging on to an account, these men should be relieved of that account and given someone else's inactive account in return. The entire sales staff can sit as judge and jury, taking away and giving accounts as they see best. "Such a system," he emphasized, "has worked for others, and it can work for you."

Frontiers

There is something more than arresting in the statement quoted last week before the Materials Handling Conference at Cleveland that the application of new methods to industrial production constitutes a new economic frontier. It is a challenging thought. The speaker, W. Bert Watson of the H. J. Heinz Company of Canada pointed up his citation by recalling how, at the turn of the century, it was believed that with population spread, and industry advancing, there were no more frontiers to pass over, no more goals to reach for. Instead, as he reminded his audience industry is now coming to realize that no matter how far the advance in technology, the frontier of accomplishment must ever be somewhere ahead. That is a thought best appreciated by those who have been close to the recent past of the paper industry's record.

W. L. Cook

Editor

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122 E. 42nd ST., NEW YORK 17, N. Y. Edited By R. G. MACDONALD, Secretary

The Effect of Chemical Agents on Iron Bacteria*

By Karman Duchon[1] with Lewis B. Miller[2]

Abstract

A systematic survey of the technical literature dealing with iron bacteria has been made. The morphology of the bacteria has been described and the leading theories of the part played by iron in the life processes of the iron bacteria have been discussed. A simple technique for growing Crenothrix polyspora *under laboratory conditions has been developed and described. Small amounts of iron salts, sugars, compounds having a reducing effect, and a low pH are found to accelerate the growth of* Crenothrix. *Many types of chemical compounds have been studied from the standpoint of their bactericidal effect upon these bacteria and within concentrations imposed by economic considerations as applied to water treatment systems. Of the chemical substances tested, chlorine or hypochlorite appeared to be the most effective in controlling bacterial growth.*

Iron bacteria are of importance in both industrial and municipal water systems, primarily because of their undesirable effects upon such systems and the problems which they pose for the water treatment engineer. Iron bacteria frequently develop rather rapidly in water systems, sometimes with astonishing rapidity. Normally they form masses of gelatinous growth containing iron compounds. These masses of growth usually adhere to the inside surfaces of pipes and tanks or coat the surfaces of filters. As the growths become heavy they tend to break loose and are carried along with the water. In many industrial uses, as in the manufacture of high grade papers or textiles, the presence of such clumps of bacteria, containing iron compounds, are very troublesome, causing spots, stains, and discoloration. The growth of the iron bacteria in pipes frequently attains such proportions that the capacities of the pipes are materially reduced. In municipal water systems these bacteria often impart unpleasant tastes and odors to the water, the tastes and odors sometimes being accentuated by chlorination. They also serve to discolor the water and to interfere in the domestic usage of the water, as by discoloring and spotting textiles during laundering.

In the Hetch-Hetchy municipal water system of San Francisco growths of iron bacteria are reported to have decreased the capacity of the main aqueduct by 16%; in the Little Rock, Arkansas, water distribution system the capacity of a 39-inch main has been reduced by 20%.

There is evidence to indicate that the growth of iron bacteria is associated with the corrosion of the inside of metal pipe lines and equipment, and the formation of tubercules and corrosion pits. (*10*).

At times the rate of growth and development of iron bacteria becomes exceedingly high, giving rise to the so-called "water calamities." Apparently such excessive rates of growth are due to environmental factors, but the specific nature of the factors involved is not clear. One of the best known "water calamities" of this character occurred in Cheltenham, England, in 1896. On March first of that year the pool of the Cheltenham public school was noted to have a reddish tint and a turbid appearance. During the month of March numerous complaints were received regarding the odor and color of the water. In April the water in the reservoir above the municipal filters became brownish-red. The sand of the filters appeared red and the water emerging from the filters was red and turbid. The condition grew steadily worse until on May 2nd the reservoir, in the words of the residents, looked like a brown "horse pond." The water being delivered to the houses had an offensive taste and odor. The quality of water further deteriorated, reaching the worst condition about the middle of May. Then the reservoir began to appear green, due to the growth of algae, and the complaints decreased. The water was again normal by June 10th. Throughout this time the water in the settling tanks above the reservoir was normal in quality, indicating that the contamination must have taken place in the reservoir (*7*).

There have been many reports in the literature of

* Summary of a dissertation submitted to the Graduate School of Arts and Sciences of the University of Cincinnati in partial fulfillment of the requirements for the degree of Master of Science.

[1] Student, University of Cincinnati, Ohio.

[2] Member TAPPI; Associate Professor in the Department of Chemical Engineering, University of Cincinnati, Cincinnati, Ohio.

Note: In preparing the photomicrographs of *Crenothrix polyspora*, illustrating the bacteria in various stages and conditions of growth and development, two objectives were kept in mind. First, illustrations were desired which would be typical of the bacteria as they are found in nature and as developed in our laboratory cultures. Second, illustrations were desired showing unusual conditoins of growth, development, and multiplication. In the latter connection the authors were unusually successful; a number of the photomicrographs presented here illustrate conditions in the life history of these bacteria which have been occasionally described in the technical literature but which have apparently never previously been photographed.

"water calamities" similar to the one at Cheltenham. These calamities have clearly been caused by excessive growths of iron bacteria (*5,7,9,22*).

In the experience of the senior author the growth of iron bacteria in the water system of a large industrial plant in Pittsburgh practically plugged off the smaller water lines and interfered greatly in the condenser system of the power plant. The water likewise possessed an offensive taste which was accentuated by a light chlorination treatment. The growths were removed from the lines and prevented from further development by a suitable program of chlorination and mechanical treatment.

Paper mills and textile factories are some of the worst sufferers from iron bacteria problems. Recirculation of large quantities of water with correspondingly high organic content offers a satisfactory environment for the growth of iron bacteria. Clogging of pipes and spotting of pulp and paper products with the ferric hydroxide which dislodges from the pipes at intervals often proves troublesome.

Definition of "Iron Bacteria"

The term Iron Bacteria is assigned to the groups of organisms capable of withdrawing iron from the water in which they live and of depositing it in the form of hydrated ferric hydroxide on or in their mucilagenous surfaces. There are several theories of the mechanisms of this procedure and there are a number of organisms in which processes of this type take place. The withdrawal and deposition of iron compounds may be necessary to the life of the bacteria or may be an incidental reaction. It is possible that in the different types of iron bacteria, the reactions are different. In some cases manganese replaces iron among these bacterial growths.

The most important group of iron bacteria for causing difficulties in water systems are the filamentous types, members of the order of *Chlamydobacteriales*. Some of the members of this order are those which have been studied in this research.

Objectives of the Current Investigation

The present investigation has been undertaken from the viewpoint of the engineer rather than of the bacteriologist although the methods of the latter have been utilized where such methods were applicable to the study of these types of bacteria. As has been indicated, growths of iron and manganese bacteria are of marked economic significance and often form troublesome problems for the engineer. A knowledge of chemical factors which may promote the growth of iron bacteria is therefore of significance. Conversely, a knowledge of chemical factors which will control or destroy such growths is of equal or even greater importance. The current investigation has as its first objective the determination of a simple laboratory technique for permitting the growth of cultures of iron bacteria. Having established such technique, the second objective is to determine those chemical factors which markedly accelerate the multiplication and growth of these bacteria, and finally the determination of those chemical factors which will control or destroy such growths. In this connection it must be borne in mind that iron bacteria "grow" in two ways, —namely by an increase in numbers and by an increase in size and length of the individual bacterium. Both types of growth may be observed microscopically, although no strictly quantitative methods have been developed by bacteriologists such as are known for many types of bacteria.

Physiology and Morphology of the Iron Bacteria

The physiology and morphology of the iron bacteria have been under study for the past century and as yet no theories have been advanced which are generally accepted. (*12*). The mechanism for the withdrawal of iron from water by these bacteria and its subsequent deposition have both been debated by many leading bacteriologists. Some of the theories of growth which have been advanced are:

1. Deposition of the iron hydroxides is one of the vital processes of the organism.

2. Deposition of the iron hydroxide is simply a chemical precipitation and is incidental to the life of the organism.

3. Deposition of the iron hydroxide is only a mechanical accumulation; the ferric hydroxide being collected by the mucilagenous surfaces.

In 1875 F. Cohn first stated that the ferric hydroxide was deposited as a result of activity of the living cells, similar to the action of diatoms on silica. Zopf, in 1882, however, was of the opinion that the ferric hydroxide was deposited mechanically on the surfaces.

The great German bacteriologist, Winogradsky, by analogy from his work on the sulphur bacteria, stated in 1888 that the iron bacteria obtained their vital energy by the exothermic oxidation of ferrous to ferric compounds with the insoluble ferric salts depositing on the sheaths of the bacteria. This idea has been further expanded by others into the hypothesis that the iron bacteria are autotrophic and obtain their organic structure by reduction of carbonates to sugars and other cell essentials by the oxidation of ferrous compounds (*19,20,23*). Iron bacteria are therefore classified in *Bergey's Determinative Bacteriology* as autotrophic forms (*4*). However, it is thought by some bacteriologists that the iron bacteria are not autotrophs. James Campbell Brown in 1903 stated that he found iron bacteria growing in ferruginous

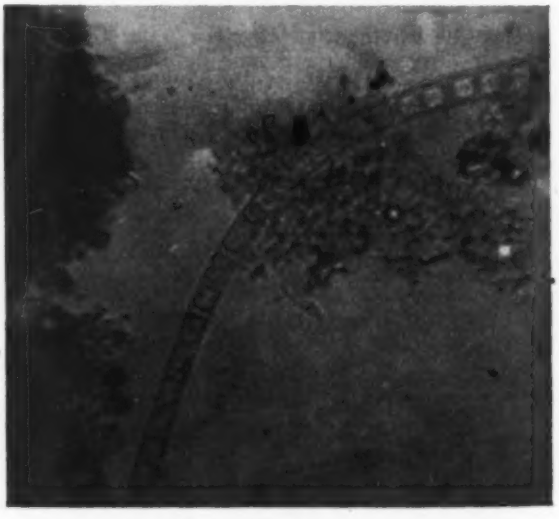

Fig. 1

Culture photographed 13 days after preparation. Culture contained 10 p.p.m. $FeSO_4$, 10 p.p.m. dextrose, and 10 p.p.m. KCN, in distilled water. The photograph illustrates cells inside the sheath of a strand of *Crenothrix polyspora*. Some of the cells are seen dividing. Magnification: 912 diameters.

waters which contained iron salts in combination with organic matter of an acid character (*7*).

Molisch in 1910 stated that he grew iron bacteria in iron-free water containing organic matter but that the growth was slight (*7*). In more recent times, iron bacteria have been reported living naturally in iron-free waters (*17*).

An hypothesis was first offered by Molisch and then expanded by Ellis stating that in iron-bearing water some of the iron is held in combination with organic matter. Iron bacteria exhibit a preference for these compounds and absorb them; digest the organic matter; and precipitate the iron. This iron is retained by the mucilaginous matter around the bacteria and builds up in the sheath. Here the iron is oxidized and forms ferric hydroxide. This hypothesis therefore suggests that the iron acts as an agent and under certain conditions can either be replaced or omitted. The fact that manganese can replace iron

FIG. 2

Culture photographed 18 days after preparation. Culture consists of 10 p.p.m. $FeSO_4$ and 10 p.p.m. dextrose in distilled water. The photograph illustrates the cells of cylindrical shape frequently formed in young strands of *Crenothrix polyspora*. Iodine stain used to show the cells and the sheath thickness clearly. Magnification: 416 diameters.

in the sheaths in manganous water seems to support this theory.

Halverson has presented the hypothesis that iron bacteria themselves do not effect the transformation of ferrous to ferric iron in water, but that the reaction takes place normally and the iron bacteria utilizes the energy released in the transformation (*11*).

As stated before, the exact role of iron in the physiology of the bacteria is not known. It is possible that the different species of iron bacteria may be of entirely different types and that the iron is utilized in different ways by the various species of iron bacteria. These apparent contradictions in the observations on the physiology of the iron bacteria may then be due to the study of different organisms by the different bacteriologists.

The order of filamentous *Chlamydobacteriales* has several genera. These are *Leptothrix, Sphaerotilus, Clonothrix,* and *Crenothrix*. A related form is *Gallionella* which is classified by Bergey as a member of the order of *Caulobacteriales* (*4*). *Gallionella* is usually studied with the others as it is found associated with them and is an iron bacteria by definition, even though its nature is different.

FIG. 3

Culture contained 10 p.p.m. $Fe_2(SO_4)_3$ and 10 p.p.m. dextrose in distilled water. This is an older and heavier strand than the one shown in Fig. 2. In this illustration the cells within the strand are spherical. Only a part of the strand is in perfect focus. Magnification: 416 diameters.

Leptothrix is the most widely distributed member of the family and has been recognized in ferruginous waters all over the world. The filaments are composed of cylindical, colorless cells, surrounded by a sheath which is at first thin and colorless and later becomes thick and yellow. *Leptothrix* is responsible for the fluffy, ochre-colored deposit found as a bed in most iron-water. The threads show no transverse division, do not branch, and are nonmotile. Frequently microscopic examination reveals several strands growing together, attached by their mucilaginous sheaths.

Sphaerotilus, also called *Cladothrix,* was first described by F. Cohn in 1875. It consists of very long, thin filaments frequently exhibiting false branching. The rod-shaped cells are colorless and cannot be seen without iodine staining. *Clonothrix,* which also exhibits false branching and has filaments which are not uniform, being much thicker at the base. Its cells are also colorless but are cylindrical. It has only been observed in Germany.

Gallionella, also called *Didymobelix,* is a quite common organism. It is not classified by Bergey with the other forms because it forms a stalk rather than a sheath. The strands consist of iron hydroxide which has been expelled by a kidney-shaped cell found at the end of the strand. The strand itself is inorganic, differing from the strands in the other iron bacteria. The strands frequently twist and curl appearing like a hairpin twisted on itself. In older strands, the heavy iron hydroxide deposit sometimes appears as a row of beads under the microscope. The nature of *Gallionella* was not discovered until recently by Henrici (*13*); until then, it was suspected that *Gallionella* was very closely related to *Leptothrix. Spirophyllum ferrugineum* is a form of iron bacteria which is very similar to *Gallionella,* but the structure is flat and band-like. At the present time, *Spirophyllum* is regarded as a pleomorphic form of *Gallionella* and is not classified separately.

The most important iron bacteria, from the viewpoint of the engineer, is *Crenothrix polyspora. Crenothrix* is the organism responsible for the various water calamities. One of the outstanding properties of the genus is that mature strands form a trumpetlike opening which contains a mass of small cells called gonidiae. These gonidiae, forming towards the end of the strand, are found in all sizes ranging from minute particles to the size of the mature cells.

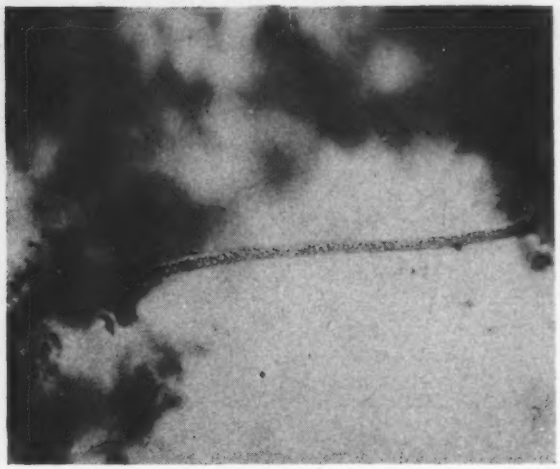

FIG. 4

The photograph illustrates a section of *Crenothrix polyspora* toward the end of a strand, stained with iodine. The cells are breaking down into gonidiae which will subsequently escape to start new strands. This is a method of reproduction of *Crenothrix*. The strand is thicker towards one end and is probably beginning the formation of the "trumpet opening," through which the gonidiae usually escape. Magnification: 416 diameters.

At times, these gonidiae are expelled rapidly from the mother strand and begin reproducing at an accelerated rate. This accounts for the rapid change in appearance of reservoirs infested with *Crenothrix*. Ordinarily, *Crenothrix* appears as very long filaments, relatively thin sheathed. Cells are found to vary from spherical to cylindrical shapes. These cells are visible without staining thus distinguishing *Crenothrix* from *Spherotilus*. When subjected to mechanical agitation, *Crenothrix* is known to discharge gonidine so rapidly that they collect in masses instead of forming filaments as is natural. The bacteria continue to multiply inside the gelatinous envelope formed which eventually breaks down to form a center of many filaments. These masses called zoogloea will be carried by water currents and are finally deposited.

Microphotographs, which have been taken in the of this research, show the characteristics of *Crenothrix* far better than any written description could.

At Cheltenham, the filaments themselves broke down at the sides and the gonidiae swarmed out from all parts of the sheath. Growth was so rapid that the water in the pipes was far more infected than that in the reservoir due to the accelerated rate of development of the bacteria in the short time that the water was in transit. This discharge of gonidiae through the sides of the sheath has been reported on very rare occasions and usually precedes a complete breakdown of the bacteria colony. In the course of this study, this situation was found once and is shown micrographically in **Fig. 14.**

Because of the peculiarities of *Crenothrix* and its importance to engineers, it was selected for special study in this research.

The filimentous iron bacteria grow to considerable lengths. *Leptothrix* and *Clonothrix* frequently grow to lengths of 200 mu and the sheath thickness, swollen with ferric hydroxide will be 2 to 3 mu in diameter. Stalks of *Gallionella* vary in length but the thickness of the sheath is usually about 0.5 mu. *Crenothrix* and *Cladothrix* have been reported to have attained lengths of several millimeters in a single strain. The thickness is from 1 to 8 mu. These very long strands are seldom seen under a microscope since the strands will usually be broken in the course of preparation of a slide because of their fragility. In the course of this study, *Crenothrix* was observed in strands over 1 mm. in length which growth had taken place within 1 month.

Another form of iron bacteria which is of passing interest is *Siderocapsa* which is found as a rust colored crust on some water plants. In the crust are found colonies of cocci that have precipitated the ferric hydroxide which forms the crust, similarly to the precipitation of ferric hydroxide on the sheaths of the *Chlamydobacteriales*. *Siderocapsa* has not been considered in this study as it is not as much of a problem to the engineer as other forms.

Laboratory growth of the iron bacteria has proven exceedingly difficult and therefore very few reports of growth are found in the literature. A few investigators claim to have grown the bacteria in solid cultures but it was not possible to keep them over any period of time. Moreover, there is no method of counting the bacteria as they grow in various lengths and do not submit to dilution techniques.

Environmental Factors Affection the Growth of Iron Bacteria

The first problem in the research was to prepare media for growth of iron bacteria. Environmental conditions were first investigated. Reports from the literature indicated the following temperature ranges to be suitable for growth *(3, 7)*:

Gallionella: optimum temperature 6° C.
fair growth at 15° C.
maximum temperature 25° C.
Leptothrix: minimum temperature 5° C.
optimum temperature 25° C.
maximum temperature 40° C.
Crenothrix: optimum range 18-24° C.

Temperature data for the other forms were not available.

The conditions of pH are vital in their effect on the iron bacteria. Reports indicate the following ranges of pH for growth:

Siderocapsa	5.5-8.2
Crenothrix	5.5-6.2
Gallionella	6.4-6.8
Spirophyllum	5.8-7.8
Leptothrix	5.8-7.8
Sphaerotilus	7.0-7.2

Although reports have been made of finding iron bacteria in iron-free water and of growing the bacteria in artificial cultures not containing iron, favorable conditions of growth indicate some iron compounds should be present. The bacteria have been found growing actively in waters containing 0.5 p.p.m. iron up to 10.0 p.p.m. In waters of the lower range, pitting of iron pipes was noted indicating consumption of the iron from the pipes. Iron bacteria have also been found growing in waters containing manganese salts.

The effect of light is doubtful. On the whole, however, the iron bacteria are found to grow better in absence of light. Some forms are never found in lighted areas.

Several media have been suggested for the cultivation of iron bacteria. No medium has been found to be universally successful. Media reported by some investigators as satisfactory for the cultivation of a species proves unsatisfactory in other cases. This is probably due to the fact that the investigators did not use distilled water and impurities present in the well waters used had a decided effect on growth. The one medium which has been accepted and used by several investigators is Winogradsky's *(6, 18)*. This

medium which was proposed in 1910 consists of extracted hay infusion and freshly precipitated ferric hydroxide. After standing several days, this medium yields a rust-colored deposit which contains *Leptothrix* among other organisms.

Winogradsky's medium was deemed unsatisfactory for this work for the following reasons:

1. The quality of the medium is unknown.
2. There is a loss in effect of ions from the interference of the protein and cellulose.
3. There is contamination with other organisms,
4. *Leptothrix* is not of prime interest to the engineer as its growth is usually not excessive.

Rullman cultivated *Crenothrix* in a solution consisting of small quantities of ferric and manganese hydroxide in a hay infusion. Media were sterilized and innoculated with slime from the reservoir of a Bavarian town which was contaminated with iron bacteria. After 3 months he obtained a satisfactory growth; however, molds and other organisms were present. He also claims satisfactory results of growth by using nutrient broth. He claims to have obtained similar results when the medium was stiffened with agar *(7)*.

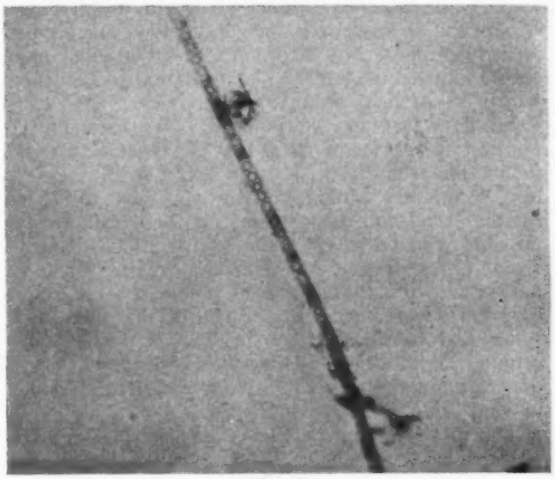

FIG. 5

Sample taken 37 days after preparation of a culture consisting of 10 p.p.m. $FeSO_4$, 10 p.p.m. dextrose, and 5 p.p.m. $K_2Cr_2O_7$ in distilled water. This photograph illustrates the breakdown of the cell structure in several places along the strand with the beginning of the formation of gonidiae. This is the beginning of a general formation of gonidiae in one end of a strand. Magnification: 416 diameters.

Adler cultivated iron bacteria by adding 0.05% ferrous ammonium citrate to the tap water of Prague which at that time was infested with iron bacteria *(7)*.

Molisch claimed to have obtained a pure solid culture of *Leptothrix* by using a medium consisting of tap water of Prague, 0.05% manganese peptone, and 10% agar. The pure culture was obtained by numerous subcultures of growth. He reported, however, that this pure culture exhibited many characteristics such as motility different from that of ordinary *Leptothrix*.

Ellis cultivated *Spirophyllum*, although impure, by using well water and freshly precipitated ferric hydroxide. Lieske claims to have obtained pure cultures of *Spirophyllum* by numerous subcultures. He used a nutrient mixture containing:

1.5 grams per liter $(NH_4)_2SO_4$
0.05 grams per liter HCl
0.05 grams per liter $MgSO_4$
0.05 grams per liter K_2HPO_4
0.01 grams per liter $Ca(NC_3)_2$
0.05 grams per liter iron filings
Continuous bubbling CO_2
Distilled water

Several culture media have been suggested for growth of *Sphaerotilus* such as Ritter's peptone and Bussoff's peptone *(18)*.

By utilizing well water and various iron salts, Harder was able to keep *Crenothrix* alive and growing but was unable to achieve pure cultures or expansion into colonies. Among the organic iron salts he found ferric ammonium citrate to be best and ferrous sulphate or ferrous carbonate best among the inorganic salts. He used 0.1% solutions and obtained his samples by filtering water through a Berkefeld filter for several days; removing the iron bacteria from the filter using a solution containing ferrous carbonate and sodium acetate. Harder states that it was impossible to prepare pure cultures of *Crenothrix*.

It will be noted that very little satisfactory cultivation of *Crenothrix* has been made and that cultivation usually involved chiefly the water in which the iron bacteria were originally found. Claims for the formation of pure cultures of iron bacteria have been very rare. In 1939, Cateldi claimed to have grown *Leptothrix* in pure liquid media using Winogradsky's media utilizing many subcultures *(6)*.

By the nature of this problem, the type of medium desired was one which would be as simple as possible, would sustain life, and encourage growth. This type of medium would be most adaptable to study of the effect of specific substances. Experiments were made using iron salts of various concentrations, sugars, and a few inorganic substances in distilled water to determine whether this would provide a sufficient medium to meet the demands of growth. Experiments utilizing solid culture media were unsuccessful. Pure cultures of *Crenothrix* were never obtained in our work.

Experimental Cultivation of Crenothrix Iron Bacteria

The first experiments performed involved filtration of Cincinnati water through a Seitz filter. Examination of the residue yielded no traces of iron bacteria. Samples were then obtained from some wells in Pennsylvania which were infested with iron bacteria and from a paper mill in Louisiana which was having difficulties with *Crenothrix*. Microscopic

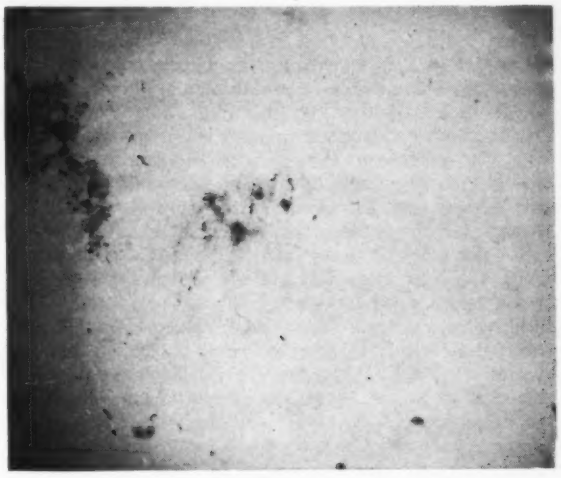

FIG. 6

Photograph illustrates a colony of *Crenothrix* growing from a central point. The tentaclelike nature of the bacteria can be seen, demonstrating how the bacteria, attached to the inside wall of a pipe, act in clogging the pipe. Magnification: 90 diameters.

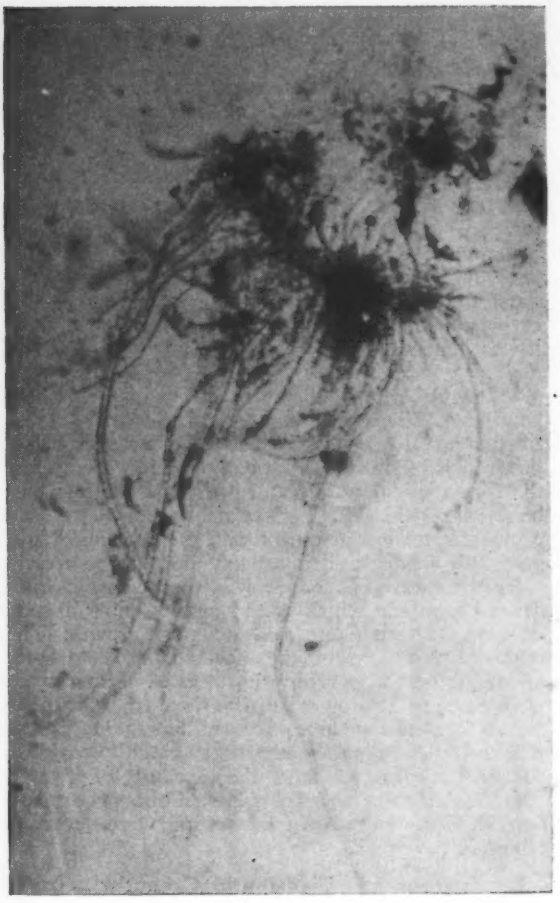

FIG. 7
This is a section of Fig. 6 enlarged four times. Magnification: 360 diameters.

analysis of all the samples revealed the presence of *Crenothrix* and *Leptothrix* sheaths and *Gallionella* stalks scattered through a ferric hydrate floc. The samples from the paper mill contained much fibrous matter which made analysis difficult. The presence of algae in the samples from the paper mill also made these samples impractical and experiments were discontinued after the first few trials. Results of these tests are not included in this paper since the few performed could not be conclusive. The bacteria in the samples of the Pennsylvania wells were in the form of very short segments. It is not known whether this was because of the agitation the samples received in shipment or the conditions in the wells at the time of collection. For simplification, the samples are designated throughout this paper as A1, A2, B1, and B2. A1 and A2 came from the same well and were received November 25, 1946. Samples B1 and B2 were taken from another well in the same vicinity and were received January 3, 1947. Samples have been maintained in their original bottles in the well water at 40°F. Occasional checks have revealed no change in the bacterial form and content except that sample B2 developed much growth of *Crenothrix* after 6 months. This was taken into consideration in the study of its samples.

In the course of this work, *Crenothrix* polyspora was the only organism that showed an increase in growth. This was fortunate for it was in *Crenothrix* that the most interest exists. All references to iron bacteria growth in the following pages therefore, refer only to *Crenothrix*.

The well water had been previously analyzed and the following table reveals the mineral content of well "A" in parts per million:

Free carbon dioxide at CO_2	16.0
Dissolved oxygen as O	0.14
Calcium hardness as $CaCO_3$	78.0
Magnesium hardness as $CaCO_3$	26.0
Alkalinity to phenol phthalein as $CaCO_3$	0.0
Alkalinity to methyl orange as $CaCO_3$	60.0
Sulphate as SO_4	4.0
Chloride as Cl	56.0
Silica as SiO_2	7.0
Total iron as Fe	2.6
Total manganese as Mn	0.0
pH	6.1

PROCEDURE FOR CULTIVATION OF IRON BACTERIA

One milliliter innoculations from the well water containing iron bacteria were added to 100 ml. distilled water test samples which contained various added constituents. One hundred and twenty five-milliliter flasks stoppered with cotton plugs were used to contain the samples. The flasks were maintained at 21°C. in incubators. Since growth of iron bacteria is better at room temperature and below, this temperature was chosen as a practical temperature. Incubators satisfied the requirement of darkened conditions which the bacteria seem to prefer.

Sterile water and sterile flasks were not used in the first few series of tests. It was expected that contamination from the well water would defeat sterilization technique. Mold growths appeared in a few samples rendering conclusions on these samples impossible or inaccurate. This mold might have appeared from spores present in the laboratory air or in the flasks; accordingly, all samples prepared after February, 1947, were made in sterilized flasks with sterile water and sterile solutions insofar as possible. The original samples used for innoculation purposes were not, of course, sterilized. Subsequently, this resulted in very little mold contamination.

The most difficult problem faced in this research was the measurement of the growth of the bacteria. Standard methods of plating bacteria were impossible since the bacteria grow in very long strands and in colonies in a feric hydroxide floc could not be uniformly diluted. Counting chambers were also impossible to use for the same reasons and because of the fact that the bacteria do not grow in regular lengths. The only technique available was to prepare slides from the samples, examine these slides, estimate the number of bacteria present, and describe the growth in each sample. It was found that slides from the same sample were not always consistent in appearance. Therefore, each sample was examined several times before a conclusion was reached regarding growth. Control tests were made in each series to facilitate comparison. Examinations were made at weekly intervals or oftener during the first 6 weeks after preparation. It was found that noticeable changes took place after about 1 week and that samples reached stable condition after about 4 weeks. After examination of several slides, the growth was classified in the following order: none, slight, moderate, considerable, plentiful, and abundant.

For the most part, staining was unnecessary for the insoluble iron hydrate deposited on the bacteria made the *Crenothrix* visible. Staining improved examination and served to uncover strands hidden in heavy floc. Staining was used when necessary in this type of sample. Lugol's iodine stained the cells most satisfactorily but did not serve to draw out the bacteria from their brown ferric hydrate background. Carbol fuchsin and gentian violet were used for this

purpose and provided an excellent temporary stain when required.

Composition and result of the tests on nutrient solutions are found in this section and are briefly summarized in the following paragraphs. Iron salts tested were ferrous sulphate, ferrous ammonium sulphate, ferric sulphate, and ferric ammonium citrate. Harder recommended the use of ferrous carbonate but does not report how this unstable compound was prepared and used *(12)*. The sulphate compounds were used in preference to others as they gave the widest range of soluble stable salts. Stock solutions of ferrous sulphate and ferrous ammonium sulphate were prepared just prior to their use each time because of their tendency to oxidize in solution when allowed to stand.

Ferric ammonium citrate, being an iron salt of an organic radical, would be an ideal compound for nutrition according to one theory of iron bacterial growth. Therefore, this compound was included in the tests.

The normal requirements of iron bacteria, as for any other living organism, is probably composed of a complex array of constituents.

The 0.1% iron salt concentrations were recommended by Harder for nutrient mixtures. This represents a concentration of 1000 p.p.m. and is far higher than concentrations found in nature. Under normal conditions, iron bacteria will live in waters containing less than 1 p.p.m. This is partly off-set since the latter figure represents running water, thus giving more contact. Since in this research conditions as close as possible to natural were desired, concentrations tested were not above 100 p.p.m.

Preliminary experiments were performed in which solutions, containing only iron salts in distilled water, were studied for their effect on growth of *Crenathrix* iron bacteria. It was found that amounts of ferrous sulphate below 5 p.p.m. did not have much effect, although they did increase growth somewhat over distilled water. Amounts from 5 to 100 p.p.m. gave consistent increased growth. Ferrous ammonium sulphate had a similar effect. Ferric sulphate solutions indicated some growth so that use of ferrous ions were not as essential as would be expected according to some of the theories presented in previous paragraphs.

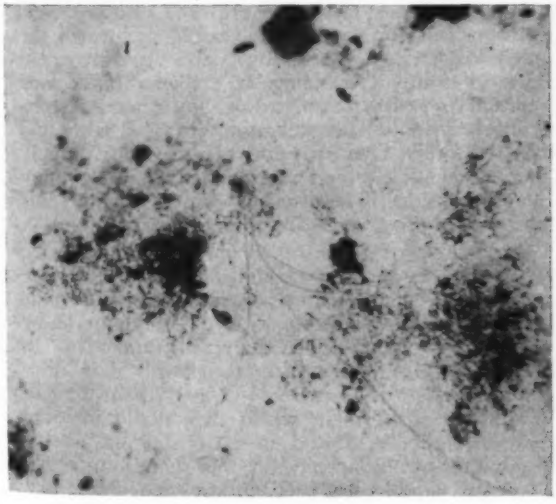

FIG. 8
This photograph illustrates the strand length attainable with *Crenothrix*. Magnification: 90 diameters.

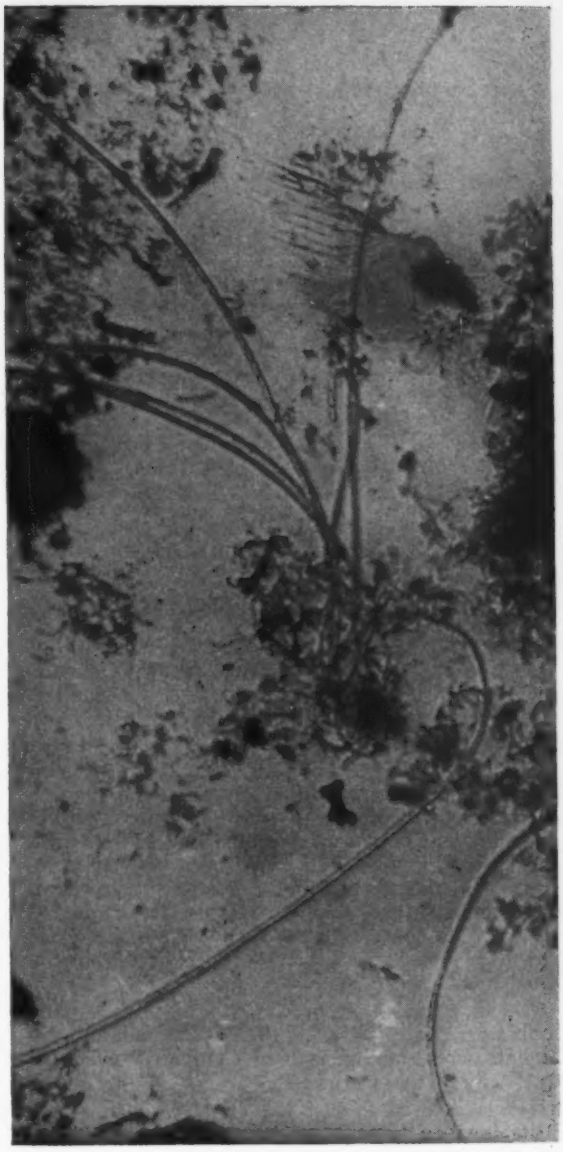

FIG. 9
This is a section of Fig. 8 enlarged three times. Cells in different strands appear both spherical and cylindrical. Magnification: 270 diameters.

Ferric ammonium citrate was only tested in six samples and results are not conclusive. While some of the tests indicated results equal to those obtained with ferrous sulphate, others did not show as much growth. Improvement in growth is noted when iron salts are used over samples containing only distilled water, but no marked differential is apparent in the various iron salts.

Many tests made to study the effect of ions other than iron can also be used in comparing the effects of the iron salts, themselves. Results are similar to those in which only iron salts have been added in that addition of an iron salt causes a marked increase in growth when compared to samples containing no iron.

When pure organic substances were tested for their effect on growth an important discovery was made. Dextrose was first tested for its effect on growth. In

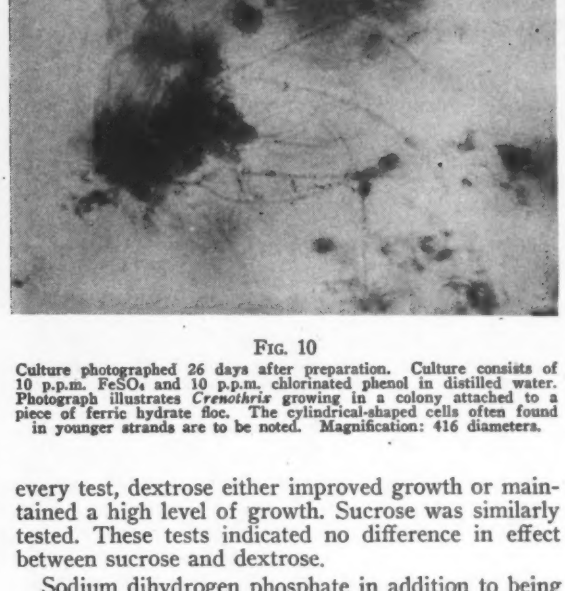

FIG. 10

Culture photographed 26 days after preparation. Culture consists of 10 p.p.m. $FeSO_4$ and 10 p.p.m. chlorinated phenol in distilled water. Photograph illustrates *Crenothrix* growing in a colony attached to a piece of ferric hydrate floc. The cylindrical-shaped cells often found in younger strands are to be noted. Magnification: 416 diameters.

every test, dextrose either improved growth or maintained a high level of growth. Sucrose was similarly tested. These tests indicated no difference in effect between sucrose and dextrose.

Sodium dihydrogen phosphate in addition to being a source of phosphate is an important buffering agent. Many tests were made to study the effect of this compound on *Crenothrix*. A comparison of tests made with and without sodium dihydrogen phosphate indicates that the compound did not affect growth of iron bacteria. Iron sulphates themselves created a hydrogen ion concentration which seems suitable for growth of iron bacteria since the pH is thus maintained in the acid range.

Results obtained from the use of ferrous ammonium sulphate indicated that the ammonium ion did not increase the growth of *Crenothrix* over that noted with simple iron salts.

It was decided to test the effect of nitrate and nitrite ions on growth on the theory that a plentiful supply of nitrogen might promote growth. To test the effect of potassium ion at the same time, the potassium salts were used. Concentrations of potassium nitrate up to 50 p.p.m. and potassium nitrite up to 10 p.p.m. were tested. Potassium nitrate did not show any effect on growth. It was noted in the course of examination that the sheaths of iron bacteria in potassium nitrate solutions seem a little heavier than usual. This observation was not studied any further as the number of bacteria present was not affected and the size of the bacteria appeared no different. Tests performed with potassium nitrite indicated that this compound improved the growth of *Crenothrix*. It is not known whether this effect was because of the increased supply of nitrogen or the reducing action of the nitrite.

Harder has suggested (as previously mentioned in this paper) the use of iron carbonates as media of growth. To simulate these tests and to test the effect of sodium bicarbonate and sodium carbonate on the growth of *Crenothrix*, tests were conducted on samples containing these compounds. In several cases sodium bicarbonate in concentrations of 5 to 10 p.p.m. seemed to exhibit an inhibiting quality; however, in a few instances they did not exhibit this quality so that the results were not conclusive. This factor was not studied further since the results obtained did indicate that the action was not outstanding. Sodium carbonate, it was known, would tend to decrease the hydrogen ion concentration of the solution, and force the solution to the alkaline range. This presumably would inhibit iron bacteria growth according to information obtained in the technical literature. Two series of tests were made and these tests indicated that sodium carbonate did effect the growth as expected. It was noted that the hydrogen ion concentration was decreased but not sufficiently to yield a pH in the alkaline range. However, this slight rise in pH must have been sufficient to decrease growth somewhat.

Calcium hydroxide was added in one test. There was no growth in this sample. A check of pH gave a reading of 7.1, a higher pH value than in any test with sodium carbonate.

A few tests were made using sample B2 with sodium chloride. The purpose of these tests was to determine whether the sodium ion had any effect and to determine whether high salt concentration affected growth. These tests indicated no change in growth because of the presence of salt.

Tests made using reducing agents yielding a most interesting discovery. Tests were first made in which the reducing agent, sodium bisulphite, was added to the test media. Results obtained revealed that addition of sodium bisulphite had definite stimulation on the growth of *Crenothrix*. Earlier tests showed that sodium ion itself did not affect the growth of iron bacteria. As the action of sodium bisulphite cannot be attributed to the sodium ion, it can be assumed that the bisulphite ion is the effective factor. The bisulphite ion was chosen for test of a reducing agent in preference to the sulphite ion because of its lower pH. To further determine whether it was the reducing action of this ion which leads to its effect on *Crenothrix*, tests were made with sodium hydrosulphite, $Na_2S_2O_4$, another reducing agent. These tests also show stimulation of growth. From these tests, and the tests performed with potassium nitrite, it is concluded that a reducing agent will increase growth of *Crenothrix*.

Cataldi indicated that his work on *Leptothrix* was performed with carbon dioxide bubbled through the samples *(6)*. On this basis, tests were performed in which intermittent bubbling of carbon dioxide was used. One set of tests utilized a Kipp generator containing limestone. The generator was filled with acid twice daily each time providing about 2-hours supply of carbon dioxide which was bubbled slowly through the test solutions. These tests seemed to show some improvement in growth from the carbon dioxide.

Another set of tests was made in which dry ice was used as a source of carbon dioxide. The dry ice was added in small quantities at intervals during the day yielding about 2 hours a day action. These samples were maintained in the refrigerator at 40°F. These tests also indicated more growth than non-treated samples. The increase in growth of *Crenothrix* in the samples in which carbon dioxide was bubbled might be caused in part at least to the agitation the samples received rather than to the effect of carbon dioxide itself. There was no substantial improvement in the growth and no further tests were performed because of the difficulties and possible errors involved.

Many authors recommend the use of manganous salts for artificial cultivation of iron bacteria. Several tests were made with manganous sulphate. Results indicated that manganous sulphate can be used to replace ferrous sulphate and the effect seems to be the same or slightly greater than with corresponding iron salts.

A complete study of the nutrition of any organism is a difficult matter and a pure culture would be essential. In this research, a thorough study into nutritional requirements was not made. However, this study was performed under more natural conditions than most of the studies reported in the literature.

The results given in this section can be used in two ways. A study of the action of the compound tested is useful in determining the effect of certain constituents, Increase in growth beyond that obtained from iron salts above were realized in samples containing sugars and even more so in those containing reducing agents. These data were also made use of in choosing a simple, satisfactory medium for studying the effect of various bactericidal agents as reported in the next section. The most suitable medium appeared to consist of 10 p.p.m. ferrous sulphate and 10 p.p.m. dextrose in sterile distilled water. For special cases as in testing chlorination and certain organic componds, the sugar was omitted from the media. Ferrous sulphate was chosen in preference to the other iron salts since it is the simplest compound and is easily prepared. The use of the ferrous ion was preferable as the true role of iron in the bacterial life cycle is not definitely known and it is found in this form in most well waters which contain iron. It is also considered more desirable than manganous sulphate since it is a more common constituent of waters containing iron bacterial growths and conditions as similar to normal environment as possible were desired.

In an earlier paragraph, the pH growth range for *Crenothrix* was given at 5.5 to 6.2. This range was quoted from several literature references. In this work, *Crenothrix* was found growing excellently in a pH range of 3.5 to 6.2. It thus apears that *Crenothrix* has a wider pH range for growth than previously reported.

Attempts to Develop a Pure Culture of Iron Bacteria

In an attempt to isolate a pure culture, solid media were made use of; agar plates containing 10 p.p.m. ferrous sulphate, 10 p.p.m. dextrose, and distilled water were used. At various times, samples were prepared using streak innoculation of floc from samples A1, A2, and B1. Plates were kept at 40°F., 70°F., and 80°F. Slight growth occurred on only one culture of B1; however, this sample was also covered with a mold growth. Inspection of the samples was made over a period of 2 months.

Letters sent to the American Type Culture Collection and to other organizations yielded no pure cultures of iron bacteria nor any suggestions for pure cultivation. Since the bacteria grow in long strands imbedded in ferric hydrate, isolation of single organisms for pure liquid cultures were impractical. Accordingly attempts to provide pure culture growths were limited to the tests just described.

Experimental Control of Crenothrix by Chemical Agents

One of the main objectives of this research is to study the effects of chemical agents on iron bacteria

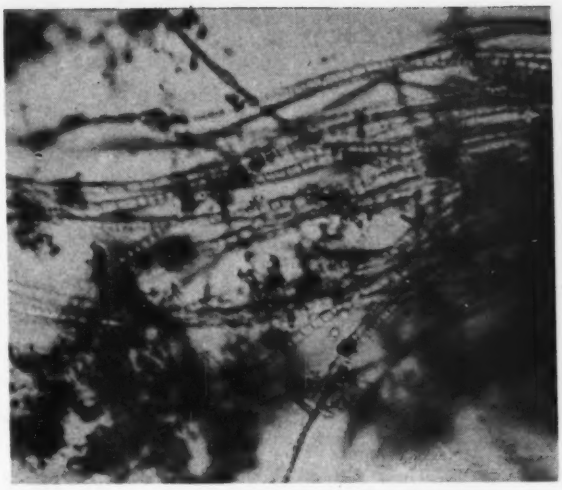

Fig. 11

This photograph illustrates a large growth of *Crenothrix* emanating from a common center which is outside the photograph. The cells are cylindrical in most of the strands which seems to be typical of young strands. Magnification: 416 diameters.

for the purpose of control. A literature survey was made to determine what measures have been used in control in order to direct experiments into the most productive channels. The following measures have been recommended for the control and elimination of iron bacteria:

1. Iron Removal: Removal of iron from water has been recommended as a means of controlling the growth of iron bacteria. This method is not considered to be feasible since our work, as well as that of earlier workers, shows that a mere trace of iron is sufficient to provide sufficient of the constituent for heavy growths of iron bacteria.

2. Treatment with Inorganic Salts: Copper sulphate is used successfully to prevent growth of algae and has therefore been suggested for control of iron bacteria. Results have indicated that high concentrations of copper sulphate sometimes retard growth; however, these high concentrations are toxic to humans when the water is used for drinking purposes. A nontoxic dose of 1 part per 20 million was reported as yielding some improvement in the iron bacteria infestation in a pool in California. Also a well was disinfected of iron bacteria by pumping 100 pounds of copper sulphate into it. *(5)*. Many other reports however, indicate negative results with copper sulphate. One report of this nature was a use of 2 pounds per million gallons without success *(2)*. Since iron bacteria seem to require the iron ion for their metabolism, it seems logical that other metallic ions would have either a stimulating or inhibiting effect on growth. No mention is found in the literature of any attempts to use other inorganic salts besides copper sulphate in control.

3. Soda-lime Treatment: Iron bacteria prefer water slightly acid so treatment to raise the pH of the water above their growth range is suggested. This has been used successfully in practice. Wilson reports that sufficient soda ash to raise the pH of a certain water system to 8.3 prevented any growth of *Crenothrix*. However, at this pH, calcium carbonate eoliths formed in the water in question interfering with distribution *(23)*.

4. Chlorination: Simple chlorination has not proven completely successful in combating iron bacteria, but

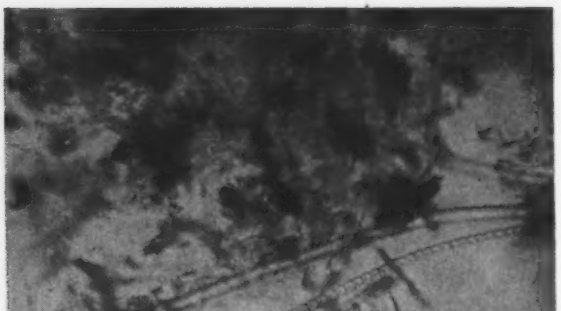

FIG. 12
This photograph shows two strands which emanate from the same origin. One strand contains spherical cells. The other strand contains a mass of gonidiae which unfortunately did not resolve well in this case. Magnification: 416 diameters.

if a chlorine residual of at least 1 p.p.m. is maintained following superchlorination, iron bacteria can be kept under control. Breakpoint chlorination plus air scrubbing has been successfully used to remove existing slime from pipes *(16)*.

As can be seen from the information above, chlorination is the only control device which has achieved a considerable measure of success. Maintenance of a chlorine residual is the major difficulty. It has been noticed that pipes which have no slime in chlorinated water will develop a slime as soon as the water loses the chlorine residual. "Dead-ends" in the system or lines which are not used frequently will accumulate growths when the chlorine residual drops off and this acts as a point of infection for the system.

It was decided as a part of the current research to test accepted methods of control by the technique developed and to try a number of types of chemical control procedures which apparently have not been previously tried.

The samples prepared to study the effect of carbonates for possible acceleration of growth of *Crenothrix* have been discussed in the previous section of this report. It was noted that bicarbonates have no effect on growth while carbonates seem to affect growth adversely. This was stated as probably being caused by the increased pH. Calcium hydroxide retarded growth as was previously indicated, because of an increase in pH.

Many lists have been made of anions which are toxic to different species of pathogenic bacteria, but no reports exist of tests on iron bacteria. Most of these anions could not be used in potable water systems because of their poisonous character. In this work, two anions were tested, the cyanide and the fluoride. Although the cyanide ion could not possibly be used, it was chosen because of its tendency to form complexes with iron. It was felt that if it were successful, substances possessing similar reactions could be used. The fluoride ion is the simplest ion found to be toxic to many types of bacteria *(19)*. Neither potassium cyanide nor potassium fluoride was found to have any definite effect on iron bacterial growth.

Naegeli in 1893 first reported the growth-inhibiting and bactericidal action of metallic salts. To this action, he gave the name "oligodynamic property." Many studies have been made of the action of metals and metallic salts upon pathogenic species. Both the metals themselves and their salts appear to possess this property. Silver has been reported to be one of the best and simplest to use. Work with silver in this country has not progressed as far as in Europe; however, patents have been made on various phases of treatment *(1)* Methods which have been suggested are *(8)*:

1. Exposing water and other liquids to metallic silver or silver precipitated on porcelain, silica, and other filter devices.
2. Use of silver salts.
3. Elecrolysis between silver electrodes at 1.5 volts.
4. Use of the EMF existing between silver and nickel electrodes maintained at different temperatures.

No reports have been made on attempts to control iron bacteria by oligodynamic techniques.

It would appear that if silver could be employed in control of iron bacteria, it would be very useful for water systems. Experiments were conducted to test the effect of silver in controlling the growth of *Crenothrix* in four ways: by silver nitrate, by silver-coated silica, by exposing water to silver metal, and by electroylsis between silver electrodes. Water exposed to silver metal has been shown by others to possess bactericidal power which it maintains for some time. Tests were conducted on water which was exposed to silver metal for several days and then used to dilute the bacterial samples. A commercial silver-coated silica product which has been recommended for use in water systems for its antiseptic qualities was tested. In the circuit which was arranged for testing electrolysis, 0.2 milliamperes current registered through the system when 1.5 volts were applied. To prevent inactivation of the electrodes by deposition, the current was alternated after each 5 minutes of operation. Tests were performed using continuous electrolysis immediately after preparation of innoculated samples and using several 5-minute electrolysis treatments during the two weeks after preparation.

Results obtained in all these tests indicate that

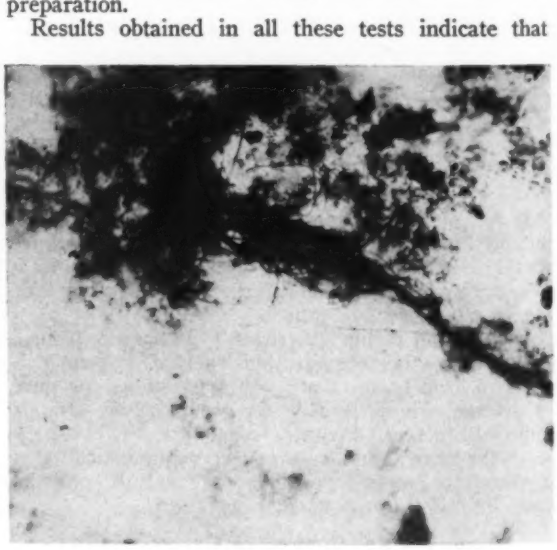

FIG. 13
Culture contains 10 p.p.m. $FeSO_4$, 10 p.p.m. dextrose, and 100 p.p.m. quaternary ammonium salt. Photograph illustrates many very long and intertwined strands of *Crenothrix*. Magnification: 90 diameters.

silver in the various forms studied has no adverse effects on the growth of *Crenothrix*. It is possible that the sheaths surrounding the bacteria act as a protective shield against the silver ions. The exact nature of the bactericidal qualities of silver are not known and the seeming immunity of *Crenothrix* to silver cannot be definitely explained.

The action of heavy metals on bacteria has been previously mentioned. Not only are the metals themselves active, but their salts also exhibit this characteristic. Lists have been compiled of the relative toxicity of the cations of the heavy metals in relation to specific organisms. It has been stated that these cations appear to be specific in their action, exhibiting good bactericidal action on some organisms and little action on others *(19)*. Most of the cations cannot be utilized in a public water system because of their poisonous nature; however, industrial systems would be able to use those which would be found to be effective against iron bacteria.

As reported previously, much of a conflicting nature has been written concerning the action of copper sulphate. As an algicide and a fungicide,

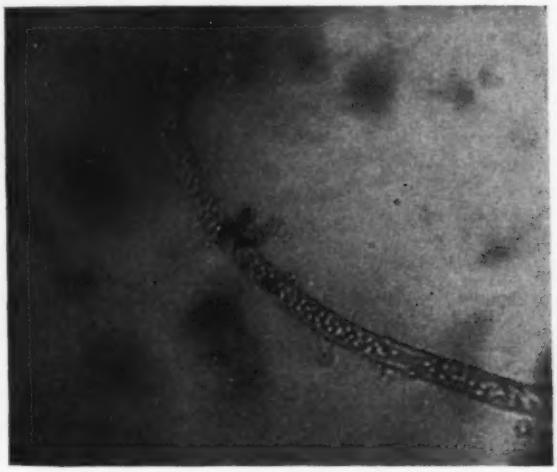

FIG. 14

Photograph illustrates gonidiae breaking through the sides of a strand of *Crenothrix polyspora* and developing new (short) strands there. This is a rare case and, so far as is known, has not been photographed previously. Magnification: 416 diameters.

copper sulphate has been widely and successfully used. Many engineers, not withstanding the nature of iron bacteria, have assumed from their appearance that they are a type of algae and have attempted to treat them accordingly. In this study, copper sulphate was tested in order to determine its effectiveness in controlling the growth of iron bacteria. In addition to copper and silver, other metallic ions tested were zinc, lead, and nickel. The dichromate ion was also tested. Mercury is toxic to many organisms and is represented in this study in the form of one of its organic compounds. The sulphate of the various metals was selected for test except in the cases of lead and silver, where the nitrates were used.

Copper sulphate showed no effect on growth in normal doses; even a solution of 50 p.p.m. had only a slightly adverse effect.

The tests performed on potassium dichromate were interesting both from a standpoint of the chromium as a heavy metal and the oxidizing nature of the chromates. Chlorine, which serves as an oxidizing agent, has been successful in controlling iron bacteria,

FIG. 15

Photograph illustrates the trumpet opening at the end of a strand of *Crenothrix polyspora* through which the gonidiae escape and begin the growth of new strands. The gonidiae (small spherical cells) can be noted in the main strand near the trumpet opening and the beginning of growth of new, small strands can be seen at the trumpet opening. The main strand contains gonidiae near the trumpet opening and cylindrical cells farther away. Magnification: 416 diameters.

while reducing agents such as sodium bisulphite seem to stimulate growth. For this reason, potassium dichromate tests were especially interesting. It was found, however, that potassium dichromate did not inhibit growth and on the contrary seemed to stimulate growth slightly. Tests were performed on the samples in series "M" after 3 weeks to determine whether any chromium remained as chromate or whether it had been reduced. In general the concentrations of chromate appear to have decreased somewhat. In all cases, however, *Crenothrix* continued to grow and develop.

The tests conducted with zinc sulphate appeared to show some control effect, but the results are not sufficiently clear cut to be conclusive. Although a few tests indicate that zinc sulphate inhibited growth, two samples tested with 20 and 50 p.p.m. zinc sulphate respectively, indicated very little effect.

Only a few tests were made with the poisonous lead nitrate. The results were negative for control of the bacterial growth.

Many tests were performed on nickel sulphate as the first few tests suggested that it might possibly inhibit growth. However, after many tests were made, the results were clearly negative in character.

Chlorination which has been successfully applied in control of iron bacteria, was also studied for comparison purposes. Tests were conducted to study the action of chlorination by application as chlorine water and as calcium hypochlorite. The chlorine residual of each sample was tested by an orthotolidine chlorimeter. Results of these tests indicate that chlorine will destroy all traces of iron bacteria and break up the flocs in which they live. In these tests a residual of 1 p.p.m. maintained by daily rechlorination for 2 weeks is required to destroy the iron bacteria. A single dose of 10 p.p.m. was found to be ineffective in the presence of organic matter which rapidly inactivates the chlorine. No differences were noted in the two forms of chlorination for controlling the growth of *Crenothrix*.

Organic substances have been recommended for antiseptic purposes against many types of bacteria. The standard agent in the field of disinfection has

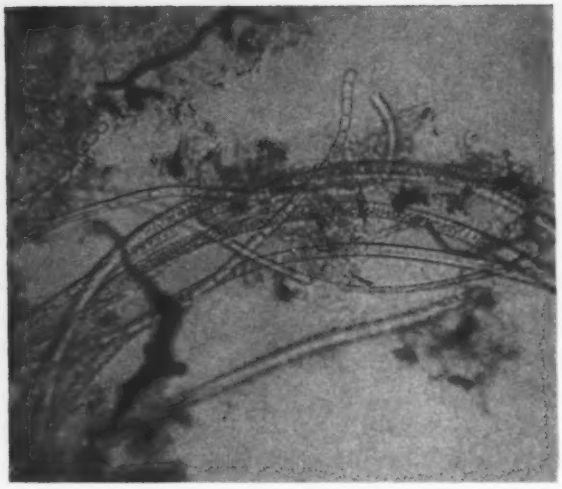

FIG. 16

Although all of these strands appear to have grown from a common source some are developing gonidiae and some contain normal cells. In one strand cells of both cylindrical and spherical shapes are to be noted. Magnification: 416 diameters.

been phenol. Many other compounds have been introduced for particular effects on bacteria but no work appears in the literature on the use of any organic antiseptic in control of iron bacteria. This study attempted to test a few of the many compounds available. Those tested were: phenol, alcohol, toluquinone, pyridyl mercuric acetate, a commercial lauryl derivative, a commercial chlorophenol, and a commercial quartenary ammonium salt.

Very low concentrations of phenol were utilized, far below the concentrations considered toxic to pathogenic species, because of the economic factor. Phenol was tested up to 25 p.p.m. and results indicate that it exhibits a stimulation of growth in the concentrations tested.

Toluquinone was studied as a representative of the quinone type compound. Interest in this group of compounds was twofold: first due to their oxidizing nature and second due to their recent mention in specific enzyme action *(14)*. Tests utilizing up to 20 p.p.m. million were conducted and in every case stimulation in growth seemed to result from its use. Accordingly, further work on this compound was abandoned.

A few tests were made with ethyl alcohol. No bactericidal action resulted.

The compound, pyridyl mercuric acetate, which is recommended in slime control, was tested. The first tests conducted indicated considerable effect but later tests did not appear as striking. It appears that pyridyl mercuric acetate possesses considerable effect in controlling the immediate growth of the bacteria but the effect for some reason decreases with time. The ultimate effect seems to show a slight decrease in growth.

A commercial lauryl derivative, which has been recommended for use in control of paper mill slimes was tested. The results are inconclusive, but indicate that this compound has little effect on the growth.

Tests were made using a quartenary ammonium compound. This compound is said to be strongly bactericidal to many types of bacteria in a concentration of 25 p.p.m. Tests conducted using up to 100 p.p.m. indicate that it serves to stimulate the growth of iron bacteria.

The various chlorinated phenols on the market are also widely used in slime control. The one used in this study was a commercial product. The tests performed seem to indicate that this compound delays growth of iron bacteria, but the ultimate growth is the same as without the compound present. An interesting result of these tests was the effect of the compound in disintegrating the ferric hydroxide floc in which the iron bacteria grow. In this action, it was similar to chlorine, but microscopic analysis of the small particles showed the presence of living iron bacteria, whereas in chlorinated samples, the bacteria appeared to be completely destroyed.

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TAPPI Notes

The TAPPI Ohio Section will meet at the Manchester Hotel, Middletown, Ohio on February 10th. There will be a panel discussion on "Tests—What, When, How Many, Why?"

The TAPPI Lake States Section will meet on Tuesday evening, February 10th, at 6:30 p.m., at the American Legion Club House in Appleton, Wisconsin. John N. McGovern of the U. S. Forest Products Laboratory will be the speaker and he will talk on "Sodium Sulphite High Yield Low Waste Pulping."

J. Edward Doyle, formerly of the Curtis Paper Company, is now chemist for the Taggart Corporation, Oswego, N. Y.

H. G. Smolens, formerly of the Hydrox Chemical Company, is now consulting engineer for BECCO Sales Corporation, Buffalo, N. Y.

Gerald L. Swope, formerly of the Owens-Illinois Glass Company, is now chief chemist for the Paper Container Div., Continental Can Company, Van Wert, Ohio.

Sereno G. Norton, formerly of the Hercules Powder Company, is now chemical engineering consultant, P. O. Box 260, Brunswick, Ga.

William A. Robinson, formerly of the Florida Pulp and Paper Company, is now technical director and pulp mill superintendent, Cia. Industrial de Atenquique, Jalisco, Mexico.

H. A. Scholl has succeeded A. O. Pearson as the official representative of the Brown Instrument Company, Philadelphia, Pa.

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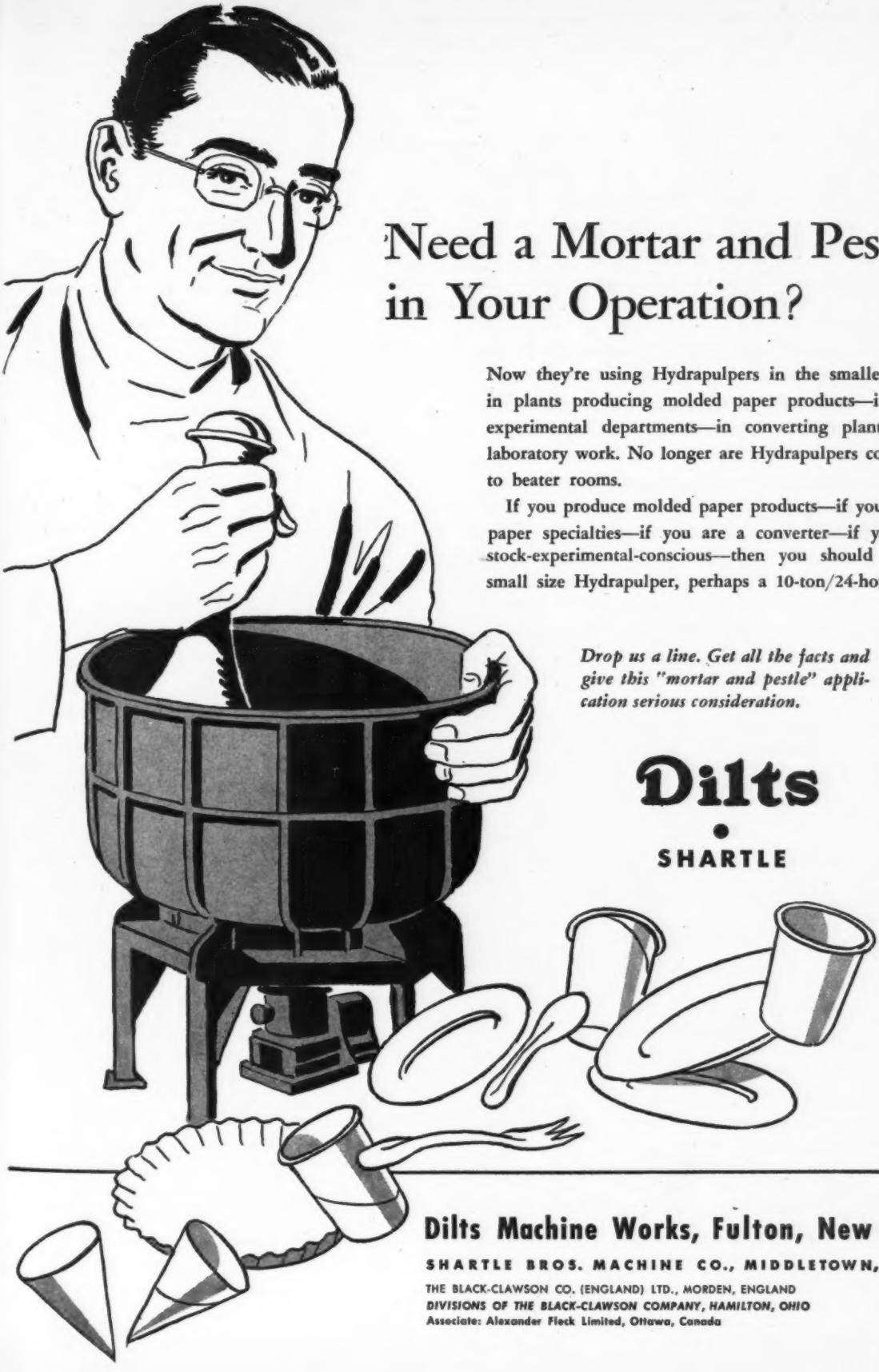

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